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MODERN RIFLE SHOOTING

FROM THE

AMERICAN STANDPOINT.

BY

W. G. HUDSON, M. D.

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PREFACE.

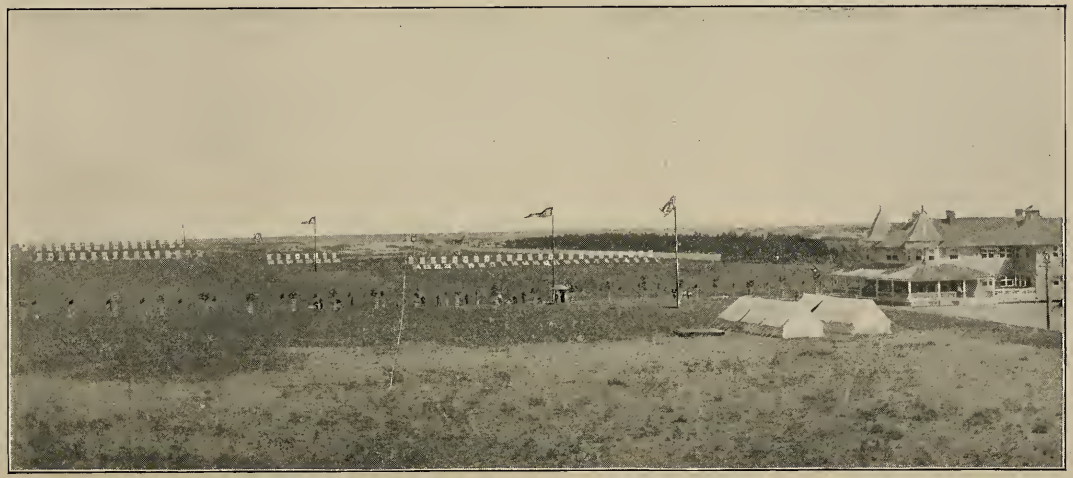
It is not without some misgiving that I venture on this, my first attempt to write a book on rifle shooting. Indeed, the idea would probably never have occurred to me had I not been asked by many brother riflemen to put into writing the numerous small matters I have at various times investigated, both for their interest and my own. Undoubtedly, much will be found in these pages that is ancient history to more experienced shooters, but if I have succeeded in making clear the first principles of rifle shooting to the beginner, I shall be well satisfied. Perhaps the experienced rifleman may find a few helpful hints, too, in some of the original devices described, and in the chapter on "the Rifleman Himself."

I have also to acknowledge the generous help received in the way of suggestions from brother riflemen, and from reading various recent English works on the subject of rifle shooting—notably those of Tippins and Freemantle. If the reflection of my study of these works shows itself in some of the thoughts expressed in the following pages, I can only say that I am not ashamed to freely acknowledge the source from which a great deal of useful information has been derived. Our English cousins have had at least five years more experience than we in the matter of high power rifles and ammunition, and a study of their methods cannot fail to benefit us.

It is almost certain that some of the tables and other information which I have gathered will have to be revised in future. We have had too little experience with our National arm up to the present time to formulate any hard and fast rules, but if this work furnishes the first stepping stones to a more thorough acquaintance with the weapon that, above all others, should be most familiar to the American citizen-soldier, the object of the author will have been accomplished.

W. G. HUDSON, M. D.

January 30th, 1903.



RIFLE RANGE, SEA GIRT, N. J.

CHAPTER I.

INTRODUCTORY.

One of the most unfortunate ideas that has ever prevailed is that so often heard expressed in the words, "The Americans are a nation of riflemen." Indeed, the saying is a relic of the day when it was literally true—the early days of our history, when to be a good rifle shot was necessary as an important aid in replenishing food supply, and as a means of preventing premature baldness through the efforts of the then ubiquitous Indian. But times have changed, and while the possibilities of the rifle have been developed to a degree never dreamed of in those days, familiarity and skill with the weapon as a national accomplishment have dwindled, until now the saying itself sounds more like a sarcasm than an aphorism. True, there are groups of men here and there even more skillful than our ancestors; but as skill with the rifle is now not generally recognized as an immediate necessity, there is little incentive to acquire and maintain it except as a sport and in connection with military duties.

But, while the immediate necessity of the American citizen learning to handle the rifle well is not so apparent as it was 100 or 200 years ago, the necessity is nevertheless real. The smallness of our regular

army, and even of the combined regular army and state militia forces, should serve to warn every American of the possibility of his being obliged some day to fight for home and country. The bustle and confusion incident to breaking out of war afford no time for training in rifle shooting. Other military duties can be learned in a few weeks or months, but the mastery of the many problems necessary to shoot well with the modern rifle requires that deliberate, careful and thoughtful study which is impossible when the whole country is thrilling with the excitement of early war. Truly, the advice "In time of peace prepare for war," applies to nothing more forcibly than to this particular kind of preparation.

Battles are not won nowadays by the brawny strength of the soldier, nor by the dramatic bravado, rush, and uproar of by-gone days. Take two modern types of soldier in action, for instance: one, that big, bronzed, muscular young fellow out on the right of the skirmish line. He is not afraid of anything, and he wants others to know it. He has longed for the excitement of battle, and he now goes at it with great zeal. He was recruited from the Y— football team, and he feels that if he could only get hold of a few of the enemy in close encounter he would dearly enjoy the scrimmage. But the enemy is half a mile away, mere brown and white specks scattered here and there over yonder field, and so, somewhat to his disgust, he is forced to fight as do his comrades,—with his rifle. He therefore spends his surplus energy, together with much good ammunition, in rapid loading and firing, nor can he know that his bullets are harmlessly whistling 40 feet over the heads of his enemies. The moral effect of such a man may be of some use in certain

places, and he would undoubtedly be valuable in a close fight—but they are rare nowadays, and are likely to become more so.

Now look at that slight, mild mannered man over on the left. He has sought out a fairly sheltered position behind a boulder, and there is none of the bluster and uproar about him—just an air of quiet confidence. He may perhaps be recognized as one of the annual competitors at Sea Girt. He never was very prominent as a military man, caring little for rank or military distinction. But he became skillful with the rifle from long practice, because he liked rifle shooting as a sport, and his name generally appeared among the winners in important matches. Now, as we watch him, he is not firing very rapidly, but is carefully observant of every detail—estimating the wind, the light, and the distance as well as he is able, and treating his rifle and ammunition with as much care as though in a match. He realizes that this is indeed a match, for life, honor and country! But while he does not shoot as rapidly as some of his comrades, nearly every time he does shoot, one of the little brown and white specks away over yonder flattens out upon the ground and stops advancing; and the enemy wonders why it is that his right suffers so much more than his left. Which of these two types of the modern soldier do you think will do the more effective work in saving the day?

The word picture is not overdrawn. The first is by far the most common type of soldier. Statistics go to show that for every man hit in battle from 3,000 to 5,000 shots are fired. And the proportion of hits is less since the advent of the modern breech loader than it was with the old muzzle loading rifle.

What we want, therefore, is to regain as a nation our old time supremacy with the rifle, so that we can make a fair percentage of hits, instead of wasting 3,000 to 5,000 rounds of ammunition for every hit we make. The experience of the Boer war has shown England that even raw and otherwise untrained men, but men who had previously acquired a certain degree of skill with the rifle, are often able to cope successfully with the trained troops of a great nation, and England is profiting by the lesson. It is hoped, also, that the Boer war will serve to open the eyes of those military tacticians in our own country who are inclined to belittle the value of accurate shooting; for surely it is the number of hits which a body of men is able to make, other things being equal, rather than its numerical strength that represents its value as a fighting body.

But, fortunately, there is an element of pleasure in shooting with the rifle in time of peace. Rifle shooting as a sport, is, indeed, so interesting when one has once gained a little insight into it, that many civilians practice it as their sole recreation. Indeed, a confirmed rifleman seldom cares for any other form of sport than his favorite one. It is this element of sport which must be relied upon to keep alive the interest in what is in reality a national duty of great importance, for, like exercise, it would soon become irksome if practiced merely as a duty.

But the chief impediment in the way of modern rifle shooting as a sport is the expense attached to it, more particularly in the way of ammunition and securing conveniently located and safe ranges. Since the advent of the modern high power rifle, with its expensive jacketed bullet and great range and penetration,

both of these sources of expense have greatly increased. The state authorities contribute some help, but it is particularly desirable to develop and encourage a taste for rifle shooting in those citizens who are not members of state militia organizations, for many of them would be called upon to fight in case of a serious war.

What we really need at present, more than anything else, is some wealthy benefactor who will realize the importance of this matter, and take an interest in fostering the sport. What a tremendous impetus could be given to it if half the amount of money now expended on racing yachts, fast automobiles and thoroughbred horses were expended in equipping a well appointed rifle range within easy reach of every large centre of population! And what popularity would be imbued into the game if some of our prominent people could be induced to spend on the rifle range a part of the time they now devote to whacking a ball around a golf field!

The state, too, could do a great deal in the way of encouraging practice with the rifle among its citizens outside the National Guard by throwing its ranges (both out door ranges and the in-door armory ranges) open to them at suitable times and under proper instructors; and it is extremely problable that this course would prove an effective means of drawing desirable recruits into the Guard, for there is an attraction in the fraternal feeling developed in a military organization that would draw in many of those who came within its sphere.

The object in writing this book is to give the beginner such elementary assistance as will bring him to a point where his interest will be quickened; and

once the enthusiasm of the sport takes hold of him, and he finds how surely improvement follows careful and intelligent effort and close attention to details, he will need no further incentive to blossom out into one of the regular fraternity of riflemen. And every addition to the ranks of the fraternity means an increase in the defensive strength of our country, for *expert riflemen are the bulwark of the nation!*

CHAPTER II.

RIFLES, BULLETS, ETC.

Target shooting as a sport has been more or less sharply divided into Match Rifle shooting and Military rifle shooting. The chief points in which the match rifle differs from the military are, its lighter trigger pull, finer sights, and better finish; and, in addition, various departures from military styles are allowed in the way of special attachments, buttplates, heavier weight of barrel, etc. The match rifle also is developed with accuracy as its chief aim, and accuracy at the particular distance it is to be used; while the military rifle has to be adapted to all ranges, and be strongly built and serviceable under adverse conditions, even if at the expense of some accuracy.

In view of these considerations, it is scarcely to be wondered at that the target rifle developed with the sole object of shooting from the off-hand position at 200 yards, as in vogue by the German-American (Schuetzen) clubs, should differ so much from the long range match—and military rifle. The Schuetzen rifle has changed but little in many years, and in its present form is probably as near perfection for its purpose as it is possible to get. Most of the modern Schuetzen rifles still use black powder, and in the finest American makes the bullet is pushed down from the muzzle as in the old muzzle loading rifles. They are extremely accurate, and the shooting is generally done on sheltered ranges; so that this kind of shooting brings the game down to merely one of skillful holding.

On the other hand, the long range match rifle has of late years approached more and more closely to the military, so much so that most of the match rifles now in use in England are merely military rifles fitted with fine target sights. Skill in shooting at the long ranges, whether with military or match rifles, involves not only good holding, but also a knowledge of the effects of disturbing factors such as changes of light, wind, barometric pressure, temperature, etc.

It must not be supposed, however, that Schuetzen rifle shooting is of no value to riflemen who aspire to honors with the military or long range rifle. It has the advantage of using very cheap ammunition, it is generally done on ranges provided with facilities that insure comfort to the shooter during even the coldest and most disagreeable weather, and it is the best possible training for fine holding. Therefore it is far better for the rifleman who would keep in practice to shoot 50 or 100 shots at 200 yards, say once a week or two weeks during the winter with a Schuetzen rifle, than to abandon the game altogether during cold weather. There are a large number of civilian riflemen who confine themselves almost entirely to this kind of shooting, and who are nevertheless very well posted and skillful riflemen, able to take up other branches of rifle shooting at short notice; and their skill in holding, and intimate knowledge of many of the technicalities of the rifle learned by long and careful practice with their own weapons certainly put them far in the lead of the novice, no matter what other branch of rifle shooting they adopt.

But it is in long range shooting, undoubtedly, that the rifleman finds the highest development of the sport. And in late years, since the advent of the modern

smokeless powder rifle of high power and small calibre, it is gratifying to note, in our American as well as in the British weapons, that the military and match rifle have approached very near to each other. In the old black powder days, the match rifle with its paper patched bullet, heavy charge of powder, and necessity of cleaning after each shot was a far different weapon than the military rifle. In those days, to attempt to shoot 1000 yards with a military rifle would have been considered the height of folly. But now, there is little difference in the scores made with match and military rifles at these long ranges.

To deal understandingly with the differences that have taken place in rifles since the adoption of the high power principle, it will be necessary to look a little into the principles governing all rifles. A rifle may be regarded as an implement embodying all the resources of science and art in the effort to throw a projectile far, swiftly and accurately. That projectile is acted upon by the natural forces precisely as is a stone when thrown from the hand, the differences, due to the higher velocity of the bullet, being in degree and not in kind. The mystery that in the minds of the uninitiated is supposed to attend the flight of a bullet is chiefly due to the fact that the bullet cannot under ordinary circumstances be observed in its flight and its motion watched, like the stone.

The first thing that may be taken as true of all projectiles, no matter how thrown, is that they fall toward the earth as soon as the support is removed from them, just the same as though they were not projectiles. But even while they are falling, the energy applied is driving them ahead. From this it will be clear that no weapon, however powerful, can drive a bullet so fast

that it will go in a straight line—it immediately begins to fall, as soon as it leaves the barrel, unless the latter has been directed upward to some extent: in which case, besides its forward motion, it will rise until the upward force also imparted to it has been expended, and then begin to fall according to the well-known law of falling bodies—slowly at first, but faster the further it falls. The flight of a bullet, therefore, is *always in a curved line.*

It does not seem as though air would offer much resistance to the passage of a body through it, but anyone who has ridden a bicycle knows that it does. Moreover, the resistance of the air increases much more than proportionately with the speed of the moving body, for if the speed be doubled, the resistance will be more than quadrupled. The air, therefore, becomes a much more potent factor in retarding the progress of a bullet than of the stone thrown from the hand, even though, weight for weight, the bullet presents less sectional area. The forward motion of the projectile, therefore, will become slower the further it travels, while its falling speed is continually increasing owing to the laws of gravity; and for this reason the further it goes, the more curved will be its flight, until at last it drops to the ground.

It is evident that the greater weight a bullet has in proportion to its sectional area, the less will be the degree of the resistance opposed to it by the air, other things being equal. An athlete could not throw a cork as far as a boy could a piece of lead of the same size and shape. Therefore the heaviest available material—lead—is used in the manufacture of the rifle bullets. For the same reason, the modern long bullet

maintains its velocity much better than the old round bullet used in the musket and early muzzle loading rifle.

But when a bullet is made longer than its diameter, some means must be taken to insure its flying in the direction of its long axis—point on. This is the object of the spiral grooves that are cut on the inside of a rifle barrel, for it is found that if the bullet be caused to rotate with sufficient rapidity on its long axis, it will not turn sideways during its flight. The degree of this twist in the rifling is called its "pitch." The longer the bullet in proportion to its diameter, the quicker the pitch of the rifling must be; if the bullet is too long for a given pitch of rifling to handle, this will be shown by the bullet going through the target in a sideways or tipping position—in the parlance of the rifleman, it "keyholes." It is necessary for the bullet to be kept point on from considerations of accuracy, as well as to maintain its velocity.

When we increase the proportionate length of our bullets and use a quicker twist of rifling, it becomes necessary to harden the bullet by the addition of tin or antimony, so that it will hold on to the rifling and not be blown straight through the barrel without following the grooves—stripping, riflemen call it. But when we reach a certain point in lengthening the bullet and increasing the pitch of the rifling, no alloy of lead is sufficient to give good results. Therefore, in the modern high power rifle, the bullet is made up of a core of lead, with a jacket of very tough metal, generally an alloy of copper and nickel; and the tough jacket holds on to the rifling so well that we are enabled to fire charges of highly explosive compounds behind the bullet, giving nearly double the velocity that it was

possible to obtain with the old black powder rifle. The modern high power rifle is, therefore, one which fires a jacketed bullet very long in proportion to its diameter, by means of a charge of smokeless powder several times as strong as black powder, with nearly double the velocity obtained with lead bullets and black powder; and as a result of the long bullet and high and well sustained velocity, the curve described by the bullet is much nearer a straight line—"its trajectory is flatter"—its penetration greater, and its range longer.

There is another deviation laterally from the straight line shown by a rifle bullet and more pronounced in rifles having a quick twist: this is called "drift." It is a lateral movement due to the spin of the bullet on its long axis. As the bullet is constantly falling in its flight, the under surface meets with more air resistance than the upper, and the bullet therefore tends to roll laterally on this denser air; so that a rifle having a right hand direction to its pitch of rifling will cause a bullet to drift to the right, while one with a left hand twist will drift to the left. Correction of this drift needs to be made on the sights of match rifles, but on the military sight of our National Arm—the Krag—the correction is made automatically when the elevation is changed.

CHAPTER III.

SELECTING A RIFLE.

Securing a perfect rifle is the first step toward good shooting. Under some conditions of military servitude, this important matter is a mere question of luck—the soldier must use what is given to him and say nothing, be the weapon good or bad. But all are not so unfortunately situated, and if there is any chance of the prospective rifleman buying the gun for himself, I would strongly recommend him to do so.

SCHUETZEN RIFLE.

If the rifle sought is a Schuetzen rifle, there will be little difficulty in obtaining a good one. The Winchester single shot, the Remington and the Stevens, are perhaps the best of those now manufactured. For this kind of shooting, the rifle should weigh between 10 and 13 pounds, have a barrel of about 30 inches length, and be chambered for either the 32-40, 32 Ideal, or 38-55 cartridge. It should have double set-triggers, a mid range vernier rear sight, and a wind guage front sight, and the butt plate should be of the Swiss or Schuetzen pattern, so as to fit the shoulder comfortably in off-hand shooting. But it is not necessary nor advisable to spend $15.00 or so extra in obtaining from the factory the special stock generally found on such rifles. These special stocks are an undoubted help to the rifleman in making fine scores, but it is far better, and costs no more, to have one made by hand to fit the shooter by an expert gun-

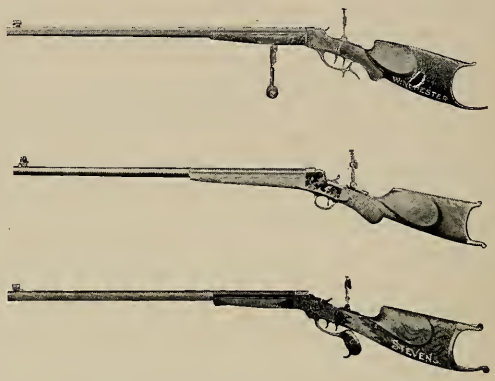


FIG. 1. SCHUETZEN RIFLES.

smith, rather than take the ones of average measurements turned out by the factory. There is the same difference in fit between the two, as there is between the ready-made and the made-to-order suit of clothes. It is time enough to get the specially made stock when one has mastered the first principles of shooting.

There are various other devices used by the off-hand rifleman with which the beginner will become familiar as he progresses; notably the "palm rest," a knob on the end of a steel rod projecting from the under side of the forearm (Fig. 1), and various peculiarly shaped trigger guards, having a hook for each finger. Many of these attachments are fitted by riflemen themselves to their own rifles, and the best results from such appliances are obtained when so fitted. Although I have done a great deal of this kind of shooting, I could never obtain any advantage from the

use of the palm rest, the fancy hooks on the trigger guard, or the large patches of leather some riflemen put around the rear sight so as to avoid the necessity of closing the left eye. Unless the shooter can appreciate a distinct gain with their aid, it is best to avoid them. But as all of these attachments are allowable, it gives free scope to the inventive genius of the rifleman, and serves to quicken his interest and develop analytical thought, closer study of the rifle, and a better knowledge of ballistic principles in general. For these reasons I look upon the 200 yard match rifle shooting as a valuable branch of the sport, and one that is likely to survive no matter how popular other branches become.

A rifle of this character, factory made, which is capable of doing fine work in the hands of a good shot, will cost between $20.00 and $25.00, if nothing in the way of ornamentation or special stock is ordered with it. If an extra fine shooting outfit is desired, for prices ranging from $25.00 to $45.00 extra, one of the special barrels made by H. M. Pope, of Chicopee Falls, Mass., or A. O. Zischang, of Syracuse, N. Y., can be fitted. But they are out of place in the hands of a beginner, who would be almost certain to ruin them. The fitting of a specially made stock, by a skilled gunsmith, in addition to the special barrel, will bring the rifle to the highest state of perfection found in this type of gun, fit for the best of our 200 yard experts to use.

The cartridges used in the 200 yard off-hand rifle are nearly always reloaded by the shooter himself, for better results by far can be obtained with ammunition of this kind than by the best factory loaded cartridges. The brass shells as now made will last from 50 to 200

shots each, in fact they last so long that the cost in new shells is almost nothing. The powder used is very cheap, and the bullets also are moulded by the rifleman himself as a rule, at a cost of about 25 cents a hundred. It will be seen, therefore, that of all kinds of shooting, this is the most economical. The ammunition question will later be considered more fully.

THE MILITARY RIFLE.

When it comes to the selection of a military rifle, all considerations of difference in pattern are of course eliminated. There is often the possibility of choosing one of a batch of rifles, however, and with a little care and perseverance I believe anyone with a certain degree of manual dexterity can determine which rifles promise to do accurate work, and which do not, by following the instructions I am about to give.

Many a military man I have observed make his selection of a gun solely on the nicety of its trigger pull. Perhaps that was because the trigger pull was the only indication available for him to go by. But there are other indications that a little study will render available, and which are of great value in selecting a good gun. The trigger pull can be totally disregarded, for anyone with a little mechanical ingenuity can adjust it to suit himself, as hereafter described.

Our chief attention, then, will center upon the barrel. First look through it just as the gun is received. It may be full of grease, or may have a thin coating of grease in which particles of dust are embedded, or it may be clean or dirty. This first inspection will serve as a pointer as to what care has recently been bestowed upon the weapon. Next, run a rag through the barrel,

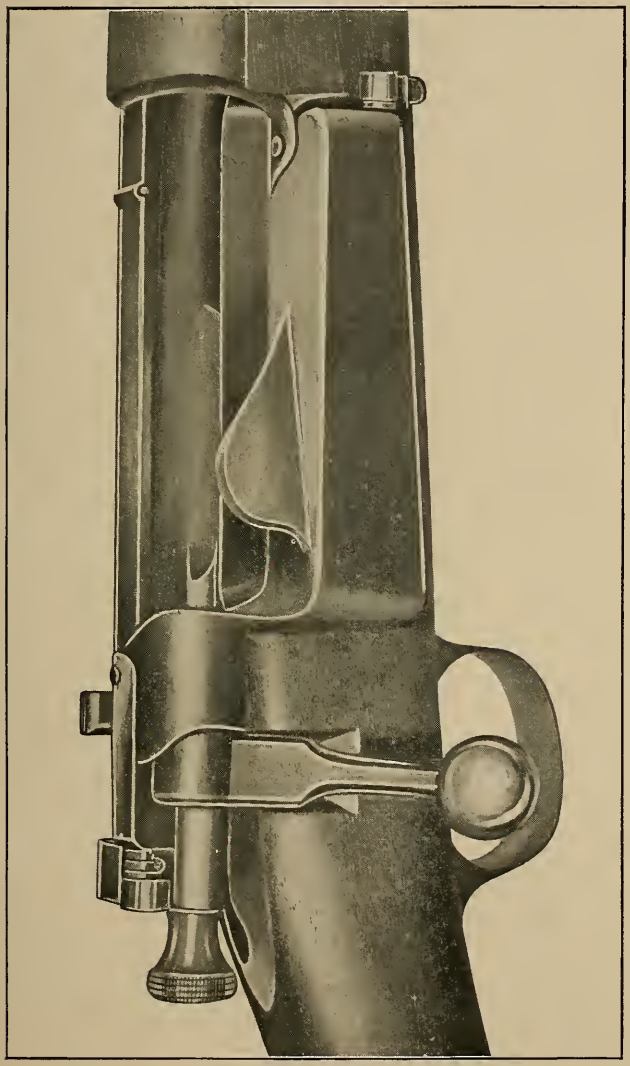


FIG. 2. KRAG ACTION CLOSED.

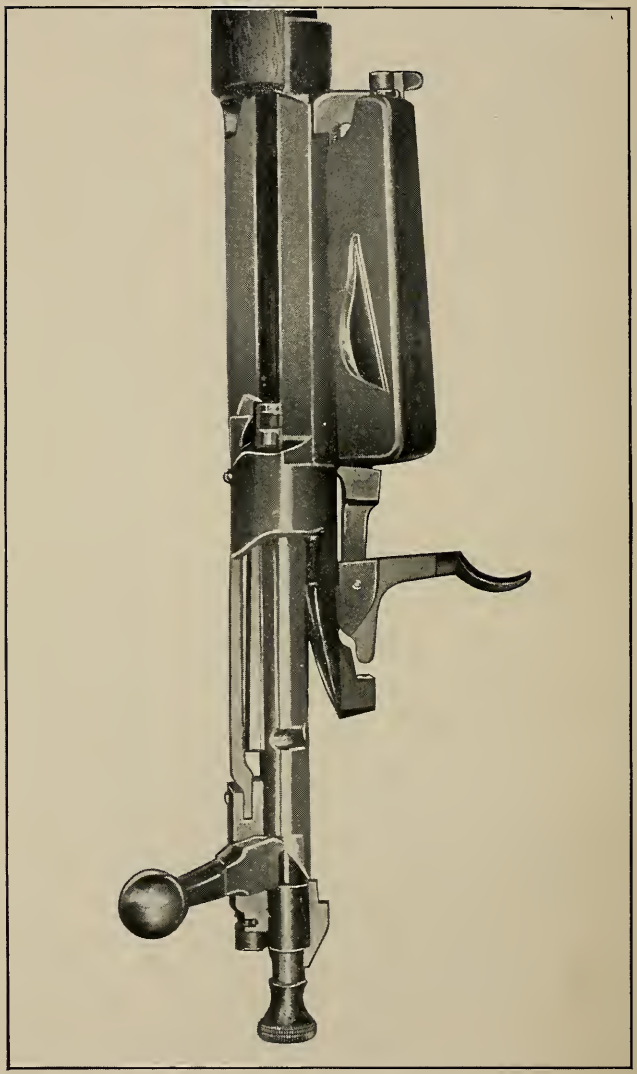


FIG. 3. KRAG ACTION OPEN. STOCK REMOVED TO SHOW MECHANISM.

always cleaning from the breech if possible. Notice what comes out on the rag—whether it is dust or dirt, or rust. If it is rust, and there are many other guns to select from, it is better to discard the gun then and there, and proceed to examine another.

After the barrel has been thoroughly wiped out with tight fitting rags, it should be taken into a good light, and its inside thoroughly examined for roughness of any kind—evidences of previous rusting, pitting, or scratches made by wrong methods of cleaning, or other abuse. Some barrels may even show a distinct bulging or "ring" in some part, where an obstruction has lodged and a ball fired through the barrel without previously removing the obstruction. Even a piece of cleaning rag inadvertently left in the gun will sometimes do this, while if the obstruction is heavy the barrel is likely to burst. Any barrel that shows these defects should of course be rejected. Some barrels, it is true, are capable of good work even though they do show rough places in their interior, but the rough spots are always liable to attract a deposit of hard fouling, which adheres most tenaciously to them; and the conditions of most military matches prohibit cleaning the rifle until the completion of the score. Therefore, any rough spot in the interior of a barrel is always a menace, and may in itself cause inaccuracy; and any defect is worse the nearer it is to the muzzle.

The next step is to determine the evenness of the bore. For this purpose, a soft lead bullet that will fit rather tightly, so as to take an impression of the rifling to the bottom of the grooves, is to be used. For the 30 calibre, the bullet of the 32-20 Winchester cartridges does very well. The barrel is first well lubricated with a thin lubricant (machine oil) and the

clean, soft bullet pushed through from breech to muzzle by means of a brass rod. Push slowly and carefully, and notice how much pressure is required. Of course, it will take some extra pressure at the breech to make the lands* cut into the bullet; but after that, the bullet should require a steady, even pressure, slightly increasing as it nears the muzzle which should be the tightest place. In other words, a rifle to do the best work should be slightly choke bored, or at any rate the calibre should not widen as the muzzle is approached. If the bullet, after being tight and smooth for a few inches, suddenly comes to a loose place in the barrel, that barrel will not as a rule shoot well in its present condition; and the nearer the muzzle the loose place is, the worse the barrel will shoot.

In making this test, it is important not to let the bullet stop, but to keep it steadily moving. Also, if precaution is taken to prevent its dropping out of the muzzle, it can be pushed back again from the muzzle to the breech, and the previous measurements verified. In the latter case, it should go easier the further it is pushed down from the muzzle.

Variations in the size of the bore from the normal will make but little difference in the older rifles, using the 45 calibre ammunition. The lead alloy used in the 45 calibre bullet will "upset"† on the explosion of the powder charge, and fill the bore so tight as to practically prevent leakage of gas past the bullet. The case is far different, however, with the 30 calibre. The hard envelope used on this bullet, the less sudden development of pressure by the smokeless powder, and

*The LANDS of a rifle are the elevated portions of the barrel, between the grooves.

the air space used in high power cartridges, all tend to prevent or modify the upsettage of the modern bullet. There can be no doubt that a certain degree of upsettage does occur with the 30 calibre, but it is not nearly so great, nor does it take place uniformly at the commencement of the rifling as in the case of the black powder rifle. The result is, if the bullet is not capable of fitting tight without upsettage, there is an escape of gas past the bullet—more on one shot, less on another, depending upon where and in what degree the upsettage takes place. Now, the uneven shooting produced by this gas leak is bad enough; but owing to their extremely high temperature and the energetic chemical characteristics of some of them, smokeless powder gases escaping past a bullet actually cut little grooves and channels in the barrel steel in their path, which in turn favor a greater escape on the next shot—forming a vicious combination, in which the effect augments the cause, and vice versa.

The dimensions of the inside of the barrel can be very accurately measured by means of the lead bullet that has been pushed through. But the pushing through should be done very carefully, so as not to upset the bullet after it is deprived of the supporting wall of the barrel. For these fine measurements a micrometer caliper is necessary, and a certain degree of skill in manipulating the same. But if one really expects to study intelligently the problems connected with rifle shooting the sooner he procures and learns how

†By the UPSET of a bullet is not meant the tipping of its axis out of proper relation with the bore; what is really meant is the foreshortening and increase in diameter due to its sudden start, very much the same as would result from the blow of a hammer delivered upon the base of the bullet.

to use a micrometer caliper, the better. The diameter of the bullet is to be taken at its widest part, where the lead has been forced down into the bottom of the grooves. A bullet which has been pushed through from breech to muzzle should not measure over .3085 inch diameter, and one that has been pushed into the rifling just ahead of the chamber and then pushed out again should not measure over .309 inch. It will be better if a barrel can be found that is ½ or 1 thousandth tighter than this, and it had better be too tight than too loose, for most of the bullets found on the market are under size. Then again, the barrel will not get smaller by wear, you may depend on it, but will get larger the longer it is shot.

Having found a barrel that meets these requirements, the gun should next be dismounted, i. e, the barrel taken off of the stock. Too much care cannot be used in doing this, to avoid marring or bending the barrel. Be particularly careful of the muzzle. Notice whether the steel bands which hold the barrel and stock together bind too tightly. They should be tight enough to hold the barrel firmly in place, but not too tight to be easily slipped off without hammering. If they bind, carefully scrape or file the wood of the stock sufficiently to free them to the proper degree. This apparently small detail is more important than it appears at first thought, for the barrel expands far more than the wood from the heat of firing, and if it is not free to slip under the bands, the tension of the wood will produce a downward curve in the barrel, just as the bow string curves the bow. The result will be that the hotter the gun gets, the lower it will shoot: or it may perhaps shoot irregularly, up and down, in the most exasperating manner.

Next examine the stock itself, to see whether it is bent or warped in any way. If it is, it is far safer to discard that stock and get another, for a warped piece of wood that has been straightened is sure to give trouble at some future time. The tension of a warped stock may appear like a trifle, but it takes little pressure to bend the barrel of a high power rifle, it is so thin. And it takes precious little bending or springing of the barrel to cause poor shooting. Indeed, success in rifle shooting is largely the result of attention to little details.

This is about as far as a rifleman, without special appliances and training, can go in the selection of a gun. It is true that a gun may pass inspection on all of these points and still be a poor shooting one from other causes too deep for the rifleman to go into, but the chances are remote; and in nearly every case a gun so selected will prove to be all right.

Further improvement can now be made in improving and adjusting the trigger pull.* On many rifles, the pull will be found to be greatly over that required by the rules. And the Krag, as it comes from the armory, is afflicted with a most annoying compound "drag"§.

*By the "weight of the trigger pull" is meant the amount of weight necessary to apply to the trigger in order to fire the gun, when held in a vertical position. It is generally tested either by means of a suitable weight provided with a rod having a hook on the end so that it can be hung on the trigger, or by means of a spring balance provided with a similar hook that can be caught in the trigger in any position, and tension applied until the lock snaps; the number of pounds being read from the scale of the spring balance. The National Rifle Association requires a four-pound pull on the military rifle

§DRAG means the distance through which it is necessary to pull the trigger before the gun will be discharged.

The lock of the Springfield is so nearly like the familiar shotgun lock that to fix it up is generally an easy matter; the chief points to bear in mind are, that the drag depends upon the depth to which the sear enters into the notch provided for it, while the pull depends on the angle at which the notch is cut. The chief difficulty is in controlling its strong spring, and if a spring vise is not available it is better to have a gunsmith make the alterations.

It is very easy for the rifleman himself to improve the trigger pull of the Krag.**

A careful examination shows that there are two elements to the drag; first, a horizontal pull along the line (A-B, Fig. 4), which feels as though one were pulling against a spring, and second, a rather grating feeling as the trigger movement changes approximately to the direction (C-D). The first element is caused by the rolling of the rounded projection (E) of the trigger upon the bottom of the receiver (F), and ends when the extremity (G) of the trigger comes in contact with the projection (H) on the receiver. The second part of the drag is caused by the pulling of the point of the sear out of the notch in the firing-bolt, into which it has entered too deeply. To remove the drag by grinding, remove the trigger and sear, and take out the pin (J) which joins them; then grind off the rounded portion of the trigger (E), so that the trigger when applied to the action without the sear will rest on the points (M-G). This removes the first element of the drag. Now put the trigger and sear together, drive the pin into place, and carefully grind off that

**In this work, the U. S. Magazine Rifle, Calibre 30-40, is referred to as the Krag, partly for brevity, and partly because that is the name by which it is popularly known among riflemen.

part of the sear, little by little, which projects above (O-P), trying the pull frequently by slipping both trigger and sear, without their spring, back into the action and snapping a few times.

The second element of the drag becomes less as this grinding progresses. If carried too far the gun cannot be cocked, as the firing-bolt will not engage in the sear. In that case the sear can be made to project more again by grinding off some of the top of the trigger at (M). In many of the rifles the bolt does not fit snugly in the action, and can be shaken up and down by the fingers, whether open or closed; with such a gun it is not safe to grind the sear down very far, as it is possible that at times the sear may not firmly catch in the firing-bolt, and the gun be prematurely fired without the trigger being touched, owing to the looseness of the bolt. This can be tested by seizing the cocking knob on the end of the firing-bolt and lifting vigorously, the gun being cocked. If the firing-bolt can be released from the sear in this way, the limit of safety has been passed; otherwise it has not. The tighter the bolt is fitted, the cleaner the gun can be made to pull.

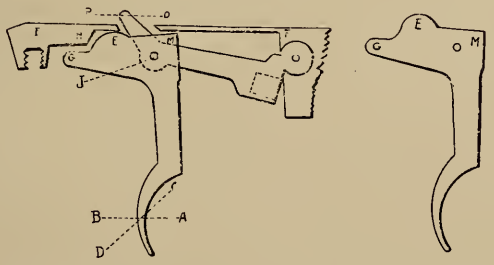


FIG. 4—DIAGRAM SHOWING CAUSE OF THE DRAG TO TRIGGER PULL IN U. S. MAGAZINE RIFLE, AND REMEDY FOR SAME.

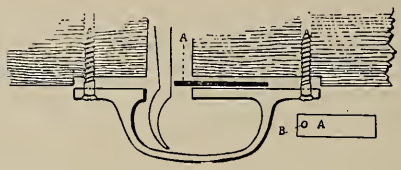


FIG. 5. SIMPLE MECHANICAL DEVICE FOR ELIMINATING THE DRAG TO TRIGGER PULL OF U. S. MAGAZINE RIFLE.

But a much easier way of eliminating the drag is by means of a thin piece of steel of the shape shown in (A, Fig. 5). A piece of hacksaw blade from which the temper has been drawn and the teeth filed off answers perfectly. This is then clamped between the trigger-guard and the wood stock of the gun as shown. A piece of bent wire inserted through the opening in the trigger-guard can be caught in the hole (B) and thus the piece of steel can be moved back and forth, in this way limiting the forward movement of the trigger, and so adjusting the depth to which the sear enters, at once removing the entire drag. When adjusted to the right point, the screws holding the trigger-guard on are tightened very firmly, preventing the steel from changing its position.

The latter method, involving the addition of a steel plate to the mechanism of the rifle, was at first objected to by the officers in charge of the National Rifle Association matches, and the rifleman who would secure the advantages of a clean trigger pull was obliged to resort to the first method, which was a proceeding along the same lines as had always been permitted in the Springfield. But the simplicity of the latter procedure was soon recognized and now the majority of riflemen who use the Krag adjust their trigger pull in this way, and no objection is made.

Besides the drag, there is as a rule a certain roughness to the trigger pull that it pays to get rid of. The roughness can be remedied by smoothing down the edge of the sear, and the notch (or rather projection) on the under side of the firing-bolt in which it engages, so that the friction will take place between two smooth surfaces. For this purpose, two small slips, one of emery and one of oil stone, will be required. They can be purchased from dealers in jewellers' and watchmakers' supplies. First use the emery, then wipe clean, and finish with the oil stone to a smooth, even polish. It is remarkable what a difference this will make in the feeling of the trigger pull.

The beginner will now have spent quite considerable time and effort in the endeavor to procure a good rifle. But what a satisfaction to have one so selected! It is the first step in forming that peculiar attachment for one's own rifle, that almost imbues it with a personality. Only one who is a rifleman himself can appreciate the superior feeling of confidence one has in his own gun over those that are new and strange to him, in whatever way it falls to his lot to use the rifle—in the hunt, in peace or in war.

As before intimated, the match rifle for long range shooting, since the use of the old black powder long range rifles has largely died out, approaches so near to the military rifle that some shooters prefer to use the same rifle for both kinds of shooting. The Krag does fine enough work with the improved ammunition now available to merit fitting a set of target sights to it. This will be considered more fully under the chapter dealing with sights. The new 30 cal. Springfield will undoubtedly be still better for the purpose, owing to its more even distribution of weight of metal in action.

The Remington-Lee is also a remarkably good action for a long range rifle of the high power type, and as it has been adopted by the State of Michigan as its official weapon, it is not difficult to fit up a Remington-Lee so that it can be used for both kinds of shooting. And it may be here stated that if the rifle comes from the Remington factory, the shooter need not worry about its ability to pass the tests just outlined, for Remington rifles are of sterling quality.

In England the most popular long range target rifle is the Dutch Mannlicher, of .256 calibre. It is certainly a fine shooting weapon, but it has the disadvantages of a light bullet that is easily deflected by the wind, its barrel wears out very quickly, and ammunition for it is not at present procurable except by importation. It is therefore far better to stick to weapons of American manufacture or at any rate to those using the United States Government cartridge; for the latter has already been improved, through the efforts of the shooting fraternity, far beyond any other cartridge manufactured in the United States. It is at present capable of very fine work at the longest ranges, and furthermore whatever additional improvement we can make in it will be of national benefit.

CHAPTER IV.

EQUIPMENT OF THE RIFLEMAN.

Besides his rifle, ammunition and sights, the Schuetzen rifleman will need little in the way of equipment. A satchel for carrying the outfit, a scorebook, carrying case, cleaning rod and cleaning materials, will be all that are really necessary; though some of the articles to be recommended for the military and long range match rifle shooter will perhaps not come amiss.

The scorebook of the Schuetzen rifleman need only be a small blank book, preferably about 3½ by 5½ inches, in which can be ruled lines and columns so as to make the recording of 10 shot scores easy. One page in a book of this size will be sufficient for recording a day's shooting. The other articles will be similar to corresponding ones in the outfit of the military or long range shooter, to the description of whose equipment we will now pass.

Besides the score book, shooting bag, carrying case, cleaning rod and materials the long range rifleman, whether he shoots with the military or match rifle, will find it convenient to carry a box for holding his target sights and vernier, a telescope or field glass, some cotton wool for plugging the ears when necessary, bottles or other receptacles for various chemicals, etc., and a small box containing various tools.

In England and Canada regular riflemen's bags are sold, with compartments arranged for each article. None have appeared on the market in this country as

FIG. 6. SHOOTING BAG SHUT.

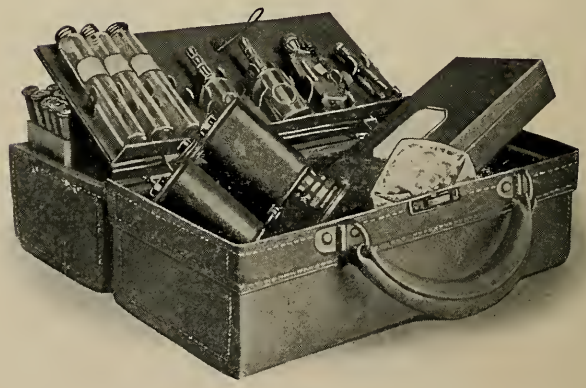


FIG. 7. SHOOTING BAG OPEN.

yet. But the rifleman can readily improvise a bag that will answer the purpose better than some of the specially made shooting bags. One that I have used with the greatest satisfaction is shown, closed, in Fig. 6, and open in Fig. 7. Its dimensions are 11 inches long, 5½ inches high, and 6 inches wide. It is one of a large variety of medicine satchels made by the Comstock-Hoff Co., of 31 Warren St., New York City. The septum in the middle is provided with metal clips intended for holding medicine bottles, but by suitable adjustment they may be made to hold many of the small articles contained in the rifleman's outfit, and the surplus ones removed. The bag is capable of being entirely opened into two halves, joined only by the hinges along the bottom, and as these two halves lie flat upon the ground all parts of the bag are readily accessible. A small sheet of rubber or oil cloth to cover the open bag will render it waterproof in wet weather.

Scorebooks for military and long range shooting have not been sold in this country of late years, although in the old long range days there were a number of different kinds published, some of them excellent. The most popular of those in use at the present time appears to be the one published by the Laflin & Rand Powder Co. I have been endeavoring to find out by practical use and by observations among the shooting fraternity just in what directions this book requires improvement, if any, and the second edition, which will embody the results of these observations is likely to be still more satisfactory. Excellent scorebooks are published in England, but they do not adapt themselves very well to our methods.

The carrying case, while not a necessity, is certain-

ly so great a convenience in protecting and preserving the rifle that the novice who has obtained a good rifle should surely buy one. Both leather and canvas cases are obtainable, at prices ranging from 75 cents to several dollars. If a good leather case can be obtained, it is preferable to a canvas one. But the majority of the leather cases one sees in use are made of very poor leather, and it is better to have a good canvas case (costing about $1.50) than a poor leather one

The cleaning rod should be about 42 inches long, of ¼-inch brass for the 30 calibres. A plain brass rod, with a suitably shaped rag holder turned on one end, and the other provided with a threaded hole for holding the brass wire brush, will be found the most durable and convenient. The fancy jointed rods are a delusion and a snare, and are well avoided by experienced riflemen. A brass wire brush, to fit the rod, should also be purchased; for 30 calibre rifles it is best to have the brush of 32 calibre, for the brass wires wear out very rapidly. For use on the knob end of the rod, rags of suitable size should be carried. Cut them so that they will fit snug, but not too tight; and remember that they will be more difficult to push through when the gun is dirty than when it is clean and oily. Canton flannel seems to be the most favored material for the cleaning rags.

Almost any kind of box can be fitted up by a rifleman of some mechanical ingenuity for carrying his target sights, vernier, and any other small and easily damaged articles he may desire to take with him. A block of wood set into the box, with recesses chiselled out for each article, and the block afterwards covered with velvet, makes a very handsome and convenient arrangement.

The telescope or field glass is almost a necessity for accurately spotting the shots in long range shooting. The new prism binocular field glasses that have made their appearance in recent years are very popular with American shooters, but cost from $35.00 to $60.00. Those made in America have seemed to me to be equal, if not better, than the imported glasses. My own are of Bausch & Lomb make, and are entirely satisfactory. For $5.00 or $10.00, however, a telescope can be obtained that is even more powerful than the prism binoculars; but it is difficult to find the target quickly enough with a telescope, so that if one is used it is advisable to fit it with some kind of a low stand that can be stuck in the ground beside the shooter. By using the latter device the glass may be kept continually focussed upon the target, and will then be even more convenient than the prism binoculars. Mirage shows better through a telescope than it does through a binocular, and often furnishes far more valuable aid in judging the wind than do the clock and range flags in such general use.

The chemicals, etc., which I have found it convenient to carry in my bag are, a bicycle oil can containing the nitro-cleaning fluid, (See formula on P. 139), another oil can containing some good thin lubricating oil, a small bottle of gasoline to aid in removing all oil from the barrel before beginning to shoot, and a bottle of liquid sight black (Formula on P. 138). Formerly I used to carry a jar of the rust preventive (P. 138) but the nitro cleaner itself seems to have very good rust preventing qualities, although when I was experimenting on it I only had in mind the development of a cleaning solution.

The tools carried by different riflemen vary greatly

in number and kind. Some carry none, and jibe their fellow riflemen for carrying them; when they get into trouble and need tools at the range, this enterprising type of individual generally borrows anything he pleases from the very man he has been ridiculing, and often forgets to return what he has borrowed. Don't start out by being that kind of rifleman. The tools I have found it very useful to carry are, a screw driver of small size, a 6-inch electrician's cutting pliers, a couple of small files, (one of them a "rat tail") and the emery and oilstone slips previously alluded to. Other tools can be added to this list if the necessity for them is felt, but these I have found of exceptional utility. They should all be of the finest quality obtainable.

A very convenient article to carry is a protector similar to that in use by the British military rifleman, especially for the front sight. It is so made that it not only protects the sight from injury, but also prevents the sight blacking from being rubbed off. Our front sight sticks up like a sore thumb, and needs it more than the British sight. The British pattern does not fit our rifles well, but one of our enterprising American riflemen, K. K. V. Casey, is at work adapting it to the American weapon, and it will probably soon be upon the market. See Fig. 8.

Having obtained these articles and supplies, the rifleman can now be considered to be pretty well equipped. He should neatly arrange them in his shooting bag, finding a place for each article where he can conveniently get at it without disarranging the other contents, and then endeavor to always keep each article in its allotted place. This will save time, temper, and enable the rifleman to more easily maintain that serene mental condition necessary for thoughtful study of the problems that confront him during his shooting.

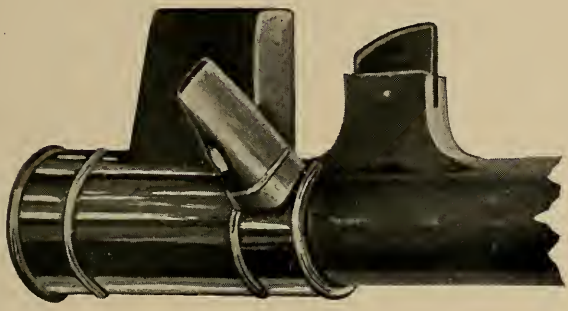


FIG. 8. SIGHT PROTECTOR OPEN.

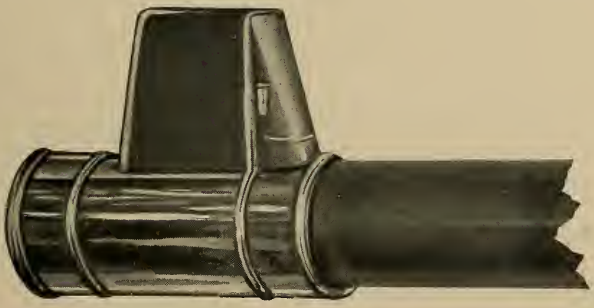
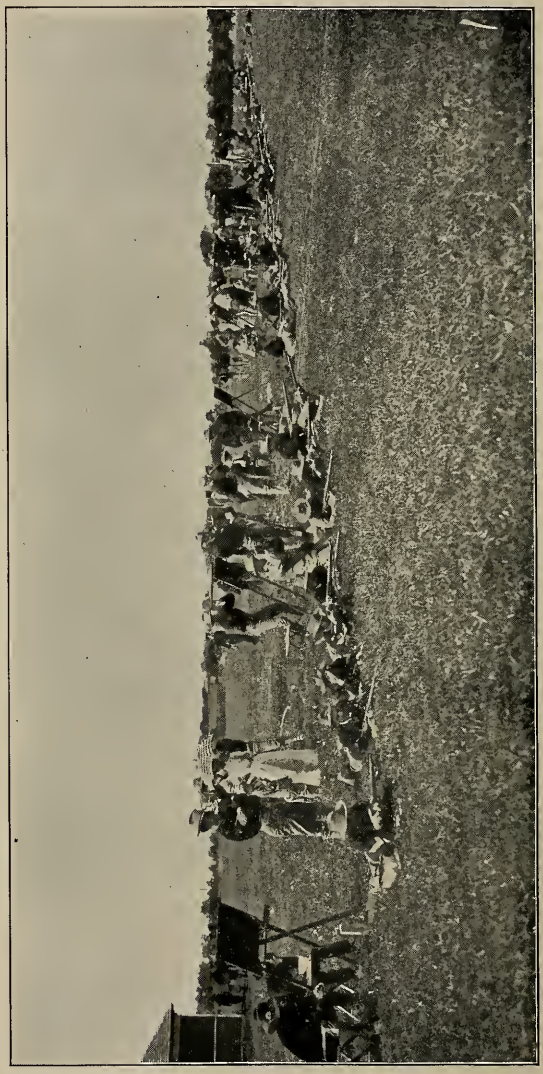


FIG. 8. SIGHT PROTECTOR CLOSED.



WIMBLEDON CUP MATCH, SEA GIRT, 1902.

CHAPTER V.

SIGHTS, SIGHTING AND AIMING.

Sights are used on a rifle for the purpose of facilitating accurate aim. In all except the shortest range gallery rifles of cheap quality, provision is made for obtaining accurately measured vertical and lateral adjustment of the sights. Sometimes one sight is fixed, and both vertical and lateral movement provided for on the rear sight. In other cases, (chiefly on target sights) lateral movement is provided on the front sight, and elevation obtained on the rear.

The sights used on military rifles are of course built for hard service, and are therefore not as fine nor as capable of delicate movement as the target sights. Two of the most popular American military sights are shown in Fig. 9, (a) is the sight issued on the Krag a

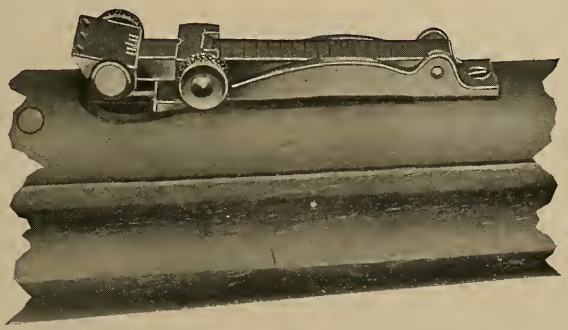


FIG. 9 A. KRAG SIGHT 1898.

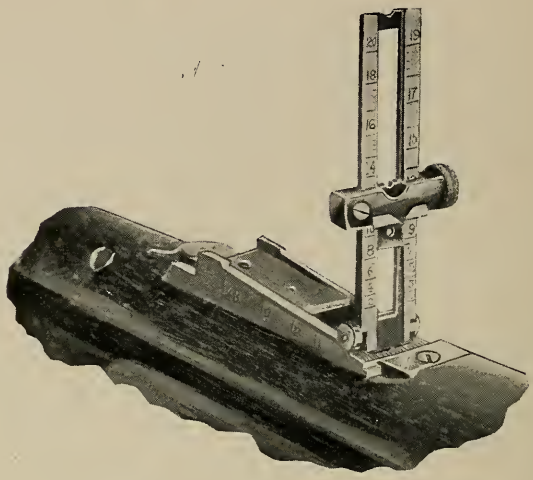


FIG. 9 B. KRAG SIGHT 1901.

few years ago, and known as the 1898 model. It is an open sight, and is still popular with some riflemen. But the best of all military sights in my opinion, is our latest, model 1901 (Fig. 9, b.). It is arranged so that it can be used either as an open or a peep sight, and has the further advantage that the drift is corrected automatically. Both sights are provided with lateral adjustments to offset the effects of the wind.

In Fig. 10 are shown various kinds of target sights. In most of these, the lateral movement is made with the front sight. But H. M. Pope, (Fig. 10, a) and the Remington Arms Company, both make remarkably good rear sights for fine target shooting that have both vertical and lateral movements. It is permissable also for target sights to be equipped with a spirit level.

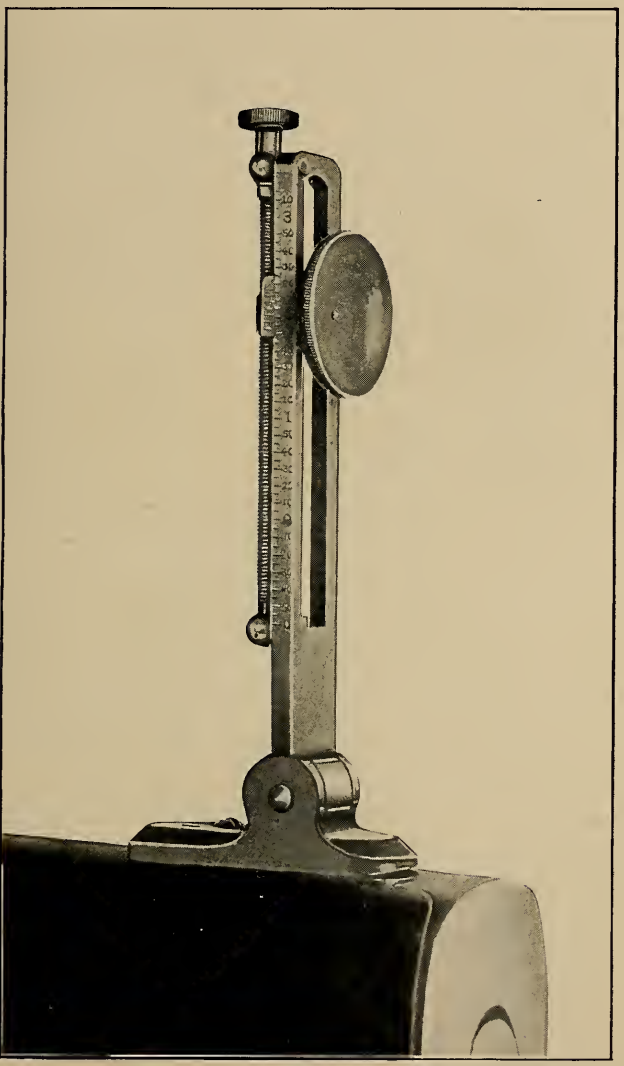


FIG. II A.

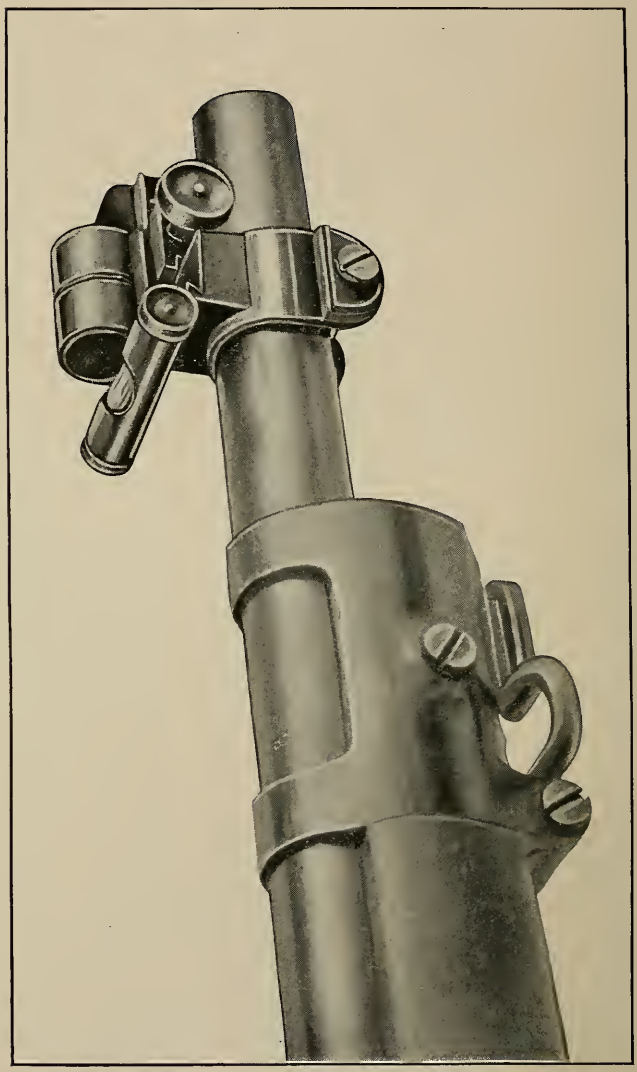


FIG. 11 B.

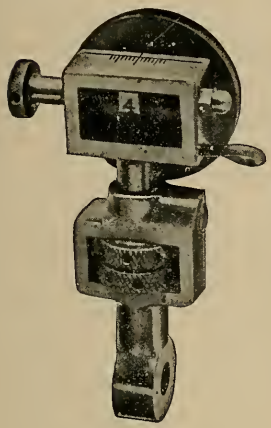


FIG. 10 A.

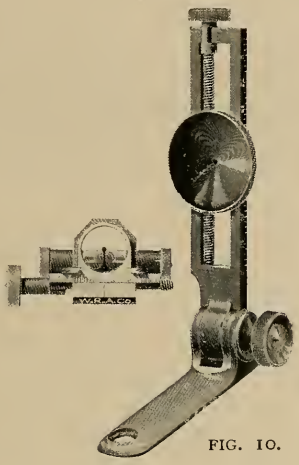


FIG. 10.

For 200 yard shooting, the rear sight is mounted in the position shown in Fig. 1. Long range shooting, when target sights are used, is generally done from the back position (Fig. 20 A page 88), and the rear sight is then mounted on the heel. In Fig. 11 I offer a photograph of the way the target sights are applied on my own military rifle, converting it when so desired into a match rifle. On the whole, I think it is more satisfactory than when I used to keep two separate rifles, one for match and one for military shooting. H. M. Pope, of Chicopee Falls, Mass., says he is willing to make these sight fittings for military rifles but they must be made to order as there is little demand at the present time for them in this country.

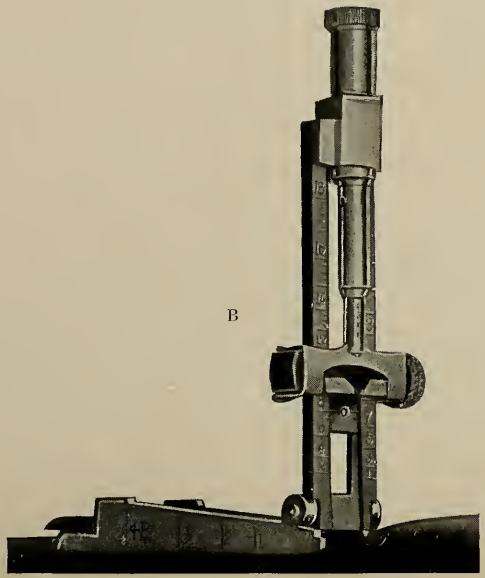


FIG. 12.

POPE SIGHT ADJUSTER APPLIED TO KRAG SIGHT.

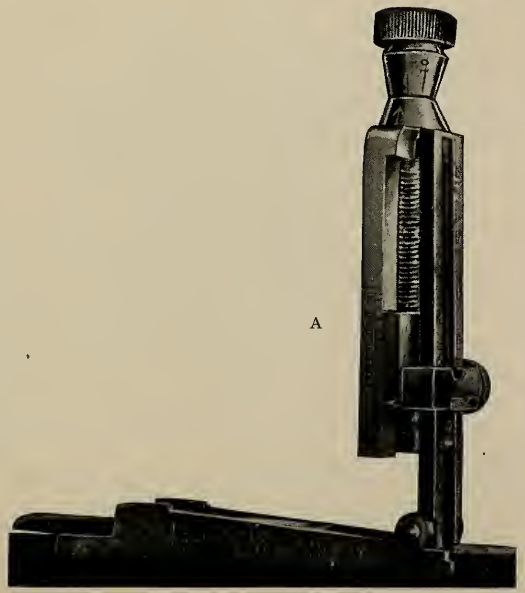


FIG. 12.

BRITISH SIGHT ADJUSTER APPLIED TO KRAG SIGHT.

Since the adoption of our most excellent military sight, riflemen have not manifested so great an interest in shooting with target sights at long range. The chief advantages of the target sights are the presence of the spirit level, the greater distance between front and rear sight as they are generally mounted, and their finer movement and graduations. The spirit level was a very great help to good shooting with the old rifles of high trajectory.* Even with the modern weapon it is an undoubted help, but by following the instructions (q.v.) in sighting, good work can be done without it. The adoption of the detachable vernier and micrometer for moving the military sight (Fig. 12) makes the movement and readings just as fine as those of the target sights. Some undoubted advantage nevertheless remains with the match sights, especially for long range shooting, and I therefore believe they should be used more than they are; for exceptional accuracy of aim is desirable when one is attempting to form an opinion as to the comparative merits of different samples of ammunition, etc. But whether through some interference with the flip of the barrel on firing or from some other cause, the Krag has never seemed to me to do quite as good work when shot from the back position as when fired from the prone position, although it can undoubtedly be held steadier. I nevertheless believe the rifleman will miss one-third of the pleasure to be derived from his rifle, if he neglects to obtain and occasionally use a set of target sights.

*Trajectory means the upward curve which a projectile makes in its flight. The trajectory is said to be "flatter" when it approaches nearer to a straight line, and "higher" when the curve is more pronounced.

The telescope sight (Fig. 13) is one deserving of more attention from a military point of view than has been bestowed upon it, and I think we may look for great development in this direction in the near future. It consists of a telescope having cross-hairs, like a surveyor's instrument, mounted on the rifle.

Its advantages are not so pronounced at the target, where we are shooting at a black spot on a well illuminated white background. But hunters have found it of great service in the pursuit of game that is very hard to see in its natural surroundings, and this is particularly the sphere in which it would be of great use in military service. For the day of the gaudy uniform is past, and our aim in the battles of the future will have to be taken at men so dressed as to contrast as little as possible with their surroundings. A kneeling man 600 yards distant in khaki uniform outlined against a sand bank is a difficult shot with the military sight, not because he represents too small a mark, but because it is almost impossible to see him. But with a telescope sight a good marksman, armed with a 30 calibre rifle, would in good weather seldom miss. The great difficulty with the telescopic sight heretofore has been the unsatisfactory nature of the mountings supplied, and the liability of both mounting and telescope to become displaced or injured.

FIG. 13. ILLUSTRATING SIDLE TELESCOPE SIGHT.

The King Optical Co., of New York, has just brought out a detachable lens sight (Fig. 14) which affords many of the advantages of a telescopic sight without the disadvantages arising from the tube and mountings of the latter. It is in reality a set of lenses to use in connection with the regular Krag sights, rather than a new sight in itself. Operating on the principle of the opera glass or "Gallileo telescope," the use of a concave eye-piece makes the employment of cross hairs as in a telescope sight impossible, for there is no way by which they could be focussed. The magnified image of the object is seen through the lenses, while at the same time the front and rear sights can be seen clearly enough to align them. This represents a new principle, so far as I am aware. The lenses are small, readily detached and applied, and can easily be carried in the pocket. The power, 4 diameters, is ample for all ordinary work the soldier would be called upon to do. It takes a little practice to get used to them, but one soon acquires the knack, and then at least as good work at the target can be done as with the military sights unaided, and very much better work if the object aimed at is indistinct to the unaided eye. This lens sight, in fact, occupies a place by itself, between the plain and the telescopic sight; and I believe it will be found to have a distinct sphere of usefulness, particularly in its adaptability to military sharp shooting.

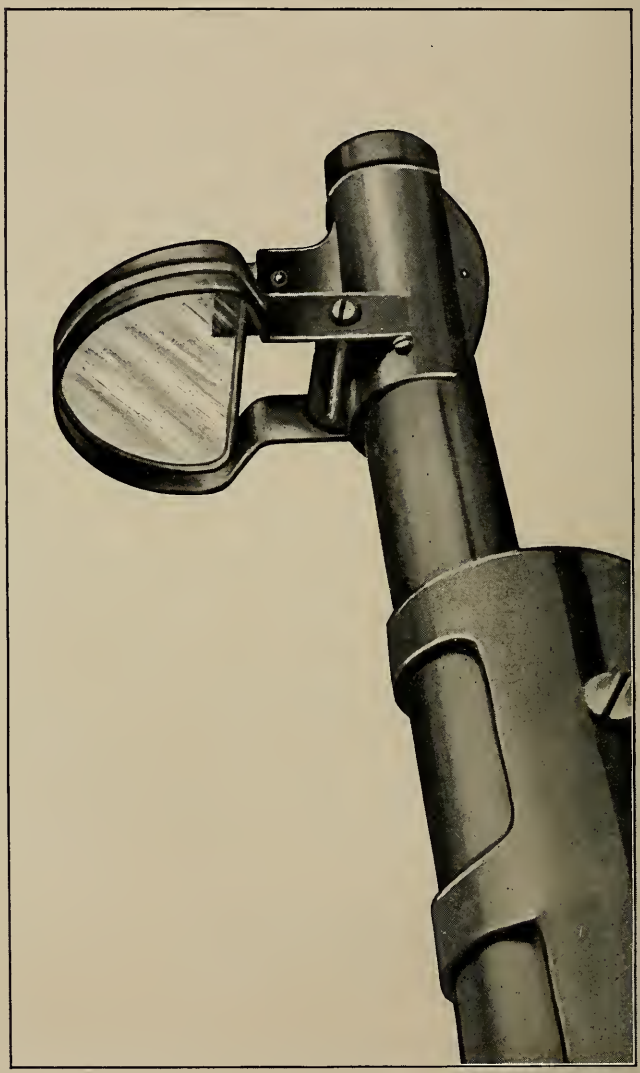


FIG. 14.

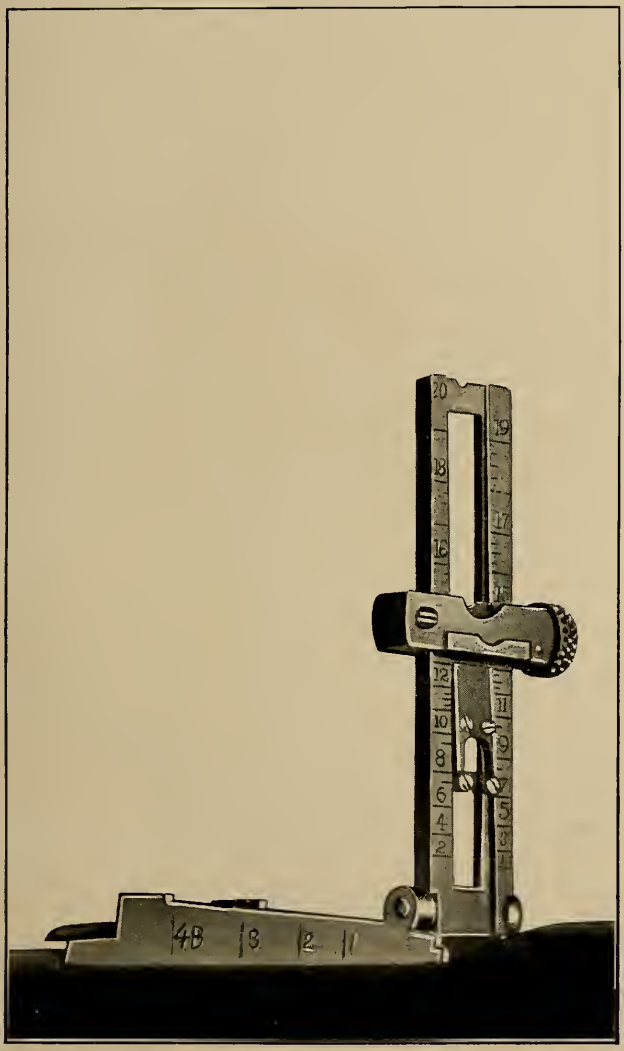
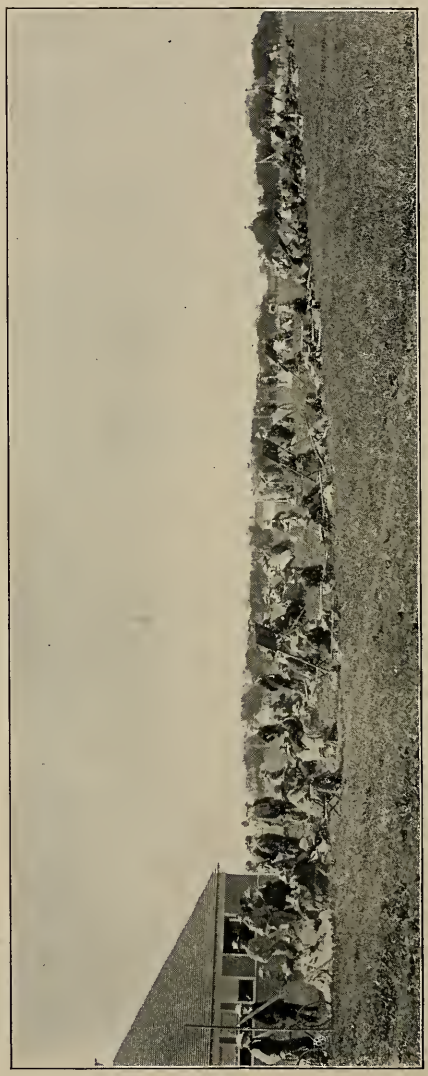


FIG. 14.



PRESIDENT'S MATCH 1000 YARDS STAGE, SEA GIRT, 1902.

CHAPTER VI.

ADJUSTING THE SIGHTS.

1.—Elevation. Finding the proper elevation to set the sights is a task that will require some perseverance on the part of the novice. With target sights, it may be necessary to begin shooting at the shortest distance and gradually work back, for the graduations on the rear sight mean nothing as the sights are made in this country, and the figures serve only as a means of keeping a record. With the military sights the case is somewhat easier, for they are marked with figures corresponding with the number of hundred yards the sight is supposed to be correct for, when set at a given mark. But so many things serve to upset the correctness of these markings, that they will rarely be found exactly right. The sights are all made the same, and different rifles shoot differently, even though both guns are apparently the same. The elevation required varies from one day to another owing to different weather conditions, and different persons aim so differently that what is correct for one will be all wrong for another. Therefore the only reliable way to do is to keep a record of the position of the sights after the proper adjustment for one's own eyes is found, making note of the date, range, condition of light, wind, temperature, and any other weather conditions on which information can be obtained, as well as accurate data concerning the ammunition used. In this way, one's old score book soon becomes a mine of valuable information; for besides indicating an average elevation from which to work at each range, it is often possible

to find a record of a previous day with identical conditions. At the shorter ranges, there will be little difference in elevation from one day to another. But at the longer ranges the difference is often so great as to throw one completely off the target.

The following conditions depress the bullet, and call for higher adjustment of the rear sight: 1, low temperature. 2, high barometer. 3, winds blowing more or less directly from the target toward the shooter. 4, light changes affect the point at which the bullet will strike, not by modifying its flight, but by causing differences in the aim that are not apparent to the shooter. Those changes which cause the shot to strike lower are: (a) much vapor or mirage.* (b) less than the usual amount of illumination on the target. (c) bright light on front sight.

Opposite conditions, to wit: High temperature, low barometric pressure, rear winds, clearing off of a mirage, bright target, and dark sights, will cause the shot to strike higher.

These effects, also, are particularly noticeable at long range. The changes of elevation caused by wind are not nearly as great as the effect of wind in deviating the bullet laterally, owing to the much smaller sectional area of the bullet viewed from the front as compared with the side. Barometric pressure, too, as a rule, changes too little and too slowly to cause much

*Mirage is that peculiar, wavering appearance which the target has when, from differences in temperature or uneven content of vapor, the air of the range is not uniform in its refraction. Looking at a brightly illuminated scene through the air above a hot radiator will illustrate mirage. On rifle ranges it is generally due to the action of the sun's heat upon the moisture in the ground.

annoyance; but it may make considerable difference from one day's shooting to another. A difference of 1 inch in the barometric pressure will only make a difference of about 4½ inches at 500 yards, but at 1000 yards it would make a difference of about 18 inches.

On the other hand, temperature and light are liable to sudden changes, and the sun suddenly becoming obscured by clouds is likely to cause a sudden disappearance of the mirage. These, then, are the disturbing factors of elevation which demand the closest watching in long range shooting. Changes of temperature affect the bullet to the extent of about 1 foot for each 10 degrees, at 1000 yards, but the effect is only about 2 inches at 500 yards. The extent of the effect of light and mirage is different on different riflemen, and will therefore have to be studied in each individual case. But memorizing the above rules will greatly aid the shooter in this study, and it should be borne in mind that the ability to correctly estimate the combined effect of several of these factors, some working one way and some the other, is one of the chief elements of success in long range shooting.

LATERAL ALLOWANCES.

Besides the lateral deviation due to drift, which has already been mentioned, the flight of the bullet is also markedly affected by wind. The drift is corrected automatically on the latest model sight (Fig. 9, b) supplied on the Krag, but on target sights it will have to be allowed for. As target sighted rifles are likely to be of many different calibres, the amount of drift correct for one will not apply to another, and therefore space forbids the insertion of rules for its correction in target rifles. It can be determined by a few trials

when the shooting conditions happen to be exceptionally good, with no wind blowing; and the position of the sights so determined should be recorded as the "Zero" for that distance, and subsequent wind allowances calculated from this point.

Even on the service sight, with its automatic drift correction, the lateral zero of the gun will not always be found to be correct as marked. It is best to determine this point as soon as a good gun is obtained, by shooting on a perfectly quiet day at 100 or 200 yards. With most of the Krags as issued, the zero will be found to be from ¼ to ½ point left. Once this zero is found, all calculations should be made from it, and not from the marked zero on the sight. The difference is not as a rule due to any change in the drift between different rifles, but in some cases to faulty workmanship or measurement in putting on the sights, and in others to errors of holding on the part of the rifleman himself. But if his errors of holding only remain constant, they will not interfere with good shooting, and the above method will then disclose the zero of rifle and shooter combined.

The drift therefore being eliminated from our calculations, the only remaining lateral disturbing factor —wind—will now be considered. And undoubtedly wind is the greatest disturbing factor of all.

Wind affects the bullet very much as the current of a river affects a boat which is propelled across it toward a definite point on the opposite shore; but with this important difference: the boat keeps up an approximately even pace, and if aimed partly up-stream to just the correct angle, its course across the river will be in a straight line. But the velocity of the bullet is continually decreasing, as we have seen, and therefore

the deflected path of the bullet is a curved line, as in the case of the trajectory. So that if the wind deflects a bullet to the extent of 1 inch at 100 yards, it will deflect it more than two inches at 200, and considerably more than 3 inches at 300, and so on.

It is for the purpose of correcting these lateral deviations that the wind guage is supplied on rifle sights. If the wind is blowing the bullet to the left of the point aimed at, then moving the rear sight to the right will cause the barrel to be pointed up into the wind somewhat, if the sights are trained as in the previous shot. And if the movement of the sight has been sufficient, the bullet should hit the target at the point aimed at.

But winds vary both in force and direction, and the effect on the bullet varies accordingly. Therefore, to shoot well, the rifleman must learn to anticipate, with some degree of certainty, what effect a given wind will have upon his bullet, so that he may make the proper correction.

The estimation of the strength of the wind has generally been a matter of guess work with most riflemen, and probably always will be more or less so. They generally judge of its force by noticing its effect upon the flags provided in various parts of the range for the purpose. While experienced shots can often by this means estimate the probable effect of wind with remarkable exactness, they sometimes fail most signally. Nor can this be wondered at when it is remembered that all flags are not the same, either in size, weight of material, etc., and the same flag will be affected far differently when wet than when dry.

TABLE OF WIND ALLOWANCES FOR THE KRAG.

Showing the amount of lateral deflection of the bullet produced by winds of different strengths at the target, and the amount of correction on sight (model 1901) required.

DISTANCE (YDS.)	FORCE OF WIND IN MILES PER HOUR.	No. OF INCHES BULLET IS DEFLECTED AT THE TARGET: BY 1-5-7 and 11 o'ck. WINDS: Amount of Deflection	BY 1-5-7 and 11 o'ck. WINDS: No. of Points on W'd Gauge Required	BY 2-4-8-10 o'ck. WINDS: Amount of Deflection	BY 2-4-8-10 o'ck. WINDS: No. of Points on W'd Gauge Required	BY 3 and 9 o'ck. WINDS: Amount of Deflection	BY 3 and 9 o'ck. WINDS: No. of Points on W'd Gauge Required
200 I pt. on Gauge gives 12 inches correction at Target.	4	2 in.	1/6 pt.	4 in.	1/3 pt.	5 in.	1/2—pt.
	8	4 "	1/3 "	8 "	2/3 "	10 "	1— "
	12	6 "	1/2 "	12 "	1 "	15 "	1 1/4 "
	16	8 "	2/3 "	16 "	1 1/3 "	20 "	1 2/3 "
	20	10 "	5/6 "	20 "	1 2/3 "	25 "	2+ "
	28	14 "	1 1/8 "	28 "	2 1/3 "	35 "	3— "
	36	18 "	1 1/2 "	36 "	3 "	45 "	4— "
500 I Pt.=30 in.	4	8 in.	1/4 +pt.	16 in.	1/2 +pt.	20 in.	2/3 pt.
	8	16 "	1/2 + "	32 "	1 + "	40 "	1 1/3 "
	12	24 "	3/4 + "	48 "	1 1/2 + "	60 "	2 "
	16	32 "	1+ "	64 "	2 1/8 "	80 "	2 2/3 "
	20	40 "	1 1/3 "	80 "	2 2/3 "	100 "	3 1/3 "
	28	56 "	2— "	112 "	3 2/3 "	140 "	4 2/3 "
	36	72 "	2 1/2— "	144 "	4 4/5 "	180 "	6 "
600 I Pt.=36 in.	4	11 in.	1/3—pt.	21 in.	2/3—pt.	26 in.	2/3+pt.
	8	21 "	2/3— "	42 "	1 1/6 "	52 "	1 1/2— "
	12	31 "	1— "	62 "	1 5/6 "	78 "	2 1/6 "
	16	42 "	1 1/6 "	83 "	2 1/2 "	104 "	3— "
	20	52 "	1 1/2 "	104 "	3 "	130 "	3 2/3 "
	28	73 "	2 "	146 "	4 "	182 "	5 "
	36	94 "	2 2/3— "	187 "	5 1/3 "	234 "	6 1/2 "

The above figures are approximate, small fractions having been eliminated.

NOTE:—Ranges 800, 900 and 1000 yards are based on my own data: the other ranges have been worked out from Ordnance Department data.

TABLE OF WIND ALLOWANCES FOR THE KRAG.

Showing the amount of lateral deflection of the bullet produced by winds of different strengths at the target, and the amount of correction on sight (model 1901) required.

DISTANCE (YDS.)	FORCE OF WIND IN MILES PER HOUR.	No. OF INCHES BULLET IS DEFLECTED AT THE TARGET. BY 1-5-7 and 11 o'ck. WINDS: Amount of Deflection	BY 1-5-7 and 11 o'ck. WINDS: No. of Points on W'd Gauge reqnired	BY 2-4-8-10 o'ck. WINDS: Amount of Deflection	BY 2-4-8-10 o'ck. WINDS: No. of Points on W'd Gauge Required	BY 3 and 9 o'ck. WINDS: Amount of Deflection	BY 3 and 9 o'ck. WINDS: No. of Points on W'd Gauge Required
800 1 Pt.=48 in.	4	19 in.	$\frac{3}{8}$ pt.	38 in.	$\frac{3}{4}$ pt.	48 in.	1 pt.
	8	39 "	$\frac{3}{4}$ "	77 "	$1\frac{5}{8}$ "	96 "	2 "
	12	58 "	$1\frac{1}{8}$ "	115 "	$2\frac{3}{8}$ "	144 "	3 "
	16	77 "	$1\frac{5}{8}$ "	154 "	$3\frac{1}{4}$ "	192 "	4 "
	20	96 "	2 "	192 "	4 "	240 "	5 "
	28	135 "	$2\frac{3}{4}$ "	269 "	$5\frac{1}{2}$ "	336 "	7 "
	36	173 "	$3\frac{5}{8}$ "	346 "	$7\frac{1}{4}$ "	432 "	9 "
900 1 Pt.=54 in.	4	23 in.	$\frac{1}{2}$—pt.	45 in.	$\frac{5}{6}$ pt.	56 in.	1 pt.
	8	45 "	$\frac{5}{6}$ "	90 "	$1\frac{2}{3}$ "	112 "	2+ "
	12	67 "	$1\frac{1}{4}$ "	134 "	$2\frac{1}{2}$ "	168 "	3+ "
	16	90 "	$1\frac{2}{3}$ "	179 "	$3\frac{1}{3}$ "	224 "	$4\frac{1}{6}$ "
	20	112 "	2+ "	224 "	$4\frac{1}{3}$ "	280 "	$5\frac{1}{6}$ "
	28	157 "	3— "	314 "	$5\frac{5}{6}$ "	392 "	$7\frac{1}{4}$ "
	36	202 "	$3\frac{2}{3}$ "	403 "	$7\frac{1}{2}$ "	504 "	$9\frac{1}{3}$ "
1000 1 Pt.=5 ft.	4	29 in.	$\frac{1}{2}$ pt.	58 in.	1 pt.	72 in.	$1\frac{1}{3}$ pt.
	8	58 "	1 "	115 "	2— "	144 "	$2\frac{2}{3}$ "
	12	87 "	$1\frac{1}{2}$ "	173 "	$2\frac{5}{6}$ "	216 "	$3\frac{2}{3}$ "
	16	115 "	2— "	230 "	$3\frac{5}{6}$ "	288 "	$4\frac{4}{5}$ "
	20	144 "	$2\frac{2}{3}$ "	288 "	$4\frac{4}{5}$ "	360 "	6 "
	28	202 "	$3\frac{1}{3}$ "	403 "	$6\frac{2}{3}$+ "	504 "	$8\frac{2}{3}$ "
	36	259 "	$4\frac{1}{3}$ "	518 "	$8\frac{2}{3}$ "	648 "	$10\frac{4}{5}$ "

The above figures are approximate, small fractions having been eliminated.

NOTE:—Ranges 800, 900 and 1000 yards are based on my own data: the other ranges have been worked out from Ordnance Department data.

To most riflemen, the flags indicate not the number of miles per hour of the wind, but so many "points" (of needed correction) on the wind guage. But realizing the desirability of having a more uniform standard to go by, I seized the opportunity afforded during the 1902 matches of the National Rifle Association to study the effects of accurately measured winds, in so far as the short time permitted. This was made possible by the Signal Corps, N. G. N. J., setting up a recording anemometer; and by keeping record of the wind required at different hours during the day, and subsequently comparing with the anemometer reading for the same time, I ascertained that with my Krag at 800 yards each point on the wind guage would correct 4 miles of wind per hour, if blowing at right angles to the path of the bullet. A 6 mile an hour wind required 1½ points, a 12 mile wind 3 points, and so on, in perfectly regular proportion. At 900 yards, one-sixth greater allowance was required; and at 1000 yards approximately 25 per cent. more than at 900 yards. (See wind table, Pages 60-61).

But winds do not always blow directly across the range from right to left, or from left to right; and obviously our calculations must be altered for these obliquities in direction, as well as for differences in force. For convenience, the rifleman refers to the direction of wind by the figures on the clock dial. The shooter is regarded as standing in the centre of an immense imaginary clock dial, and the target is supposed to be at 12 o'clock. A wind, then, coming directly from the rear, would be a 6 o'clock wind, one exactly from the right a 3 o'clock wind, one from the left a 9 o'clock wind, while a 12 o'clock wind blows directly in the shooter's face; and the various oblique winds are referred to by corresponding figures.

It is evident that a 6 o'clock or a 12 o'clock wind will cause no lateral deflection of the bullet, and that a 3 or 9 o'clock wind will cause the greatest deflection. But what proportion of the total 3 and 9 o'clock effect the oblique winds will have is a subject that demands study. Mr. Tippins, an eminent British rifleman, says that 1, 5, 7 and 11 o'clock winds have 1-3 the effect of 3 and 9 o'clock winds of the same force, and 2, 4, 8 and 10 o'clock winds 2-3. But it has seemed to me that with our American rifle there is much less difference between a 2 and 3 o'clock wind than there is between a 1 and 2 o'clock, or between a 12 and 1 o'clock. From my records kept since the Krag first came into the hands of the civilian rifleman (1900) I have formulated the table on Pages 60-61. This is scarcely a long enough experience by which to construct a perfect table, but mine appears so far to be approximately correct, and I hope that such discrepancies as become manifest—and they are not likely to be very great—will be corrected by the rifleman for his own gun.

In addition to the flags with which every rifle range is supplied there is generally a device known as a wind clock, consisting of a vane so geared to the single hand on a large clock dial, that when the wind is blowing from a given direction the hand points to the corresponding number on the clock. On most of the American rifle ranges it has been the custom to estimate the necessary wind allowance by observing closely the flags and clock dial, and these certainly afford quite reliable indications as to what is taking place in their immediate vicinity. But in inland ranges there are likely to be many local currents far different than the wind affecting the clock or some of the flags. Indeed, some of the flags may indicate precisely the opposite

direction to the clock, and to other flags in different parts of the range. On the other hand, if there is much mirage visible through the telescope, its movement often affords more reliable indications than either flags or clock; for in observing the mirage through a telescope trained on the target, we practically see the movement of the air through which the bullet must pass in its flight, and are not (mis-) guided by what is taking place far off to the one side where the flags and clock are located. In addition, the apparent movement of the mirage seems to average up the total amount of lateral deflection, which is certainly better than having to watch several flags and a dial, even if they are close to the line of fire. It was our unfamiliarity with this method of estimating wind which lost us the international match at Ottawa, Canada, in 1902; for at the 900 yard stage very unfavorable conditions arose, which it was absolutely impossible for the best coaches to judge by the flags. But the English team, who were familiar with the mirage method, did nearly as good shooting as when the weather conditions were good.

CHAPTER VII.

AIMING.

Aiming consists in aligning with the target, points represented by the front and rear sights. To do this correctly and uniformly, the rifleman must be able to see clearly both the target and the front sight. He does not actually see the rear sight, but so adjusts his head that the line of sight passes through the centre of the peep (or notch, in the case of open sighted rifles).

Of course, to see clearly, one must have good vision. There are many persons who have sufficient acuteness of vision to get along perfectly in their daily work, but who labor under the handicap of various refractive errors without being aware of the fact. These unrecognized errors sometimes cause trouble in sighting a rifle, and will be discussed more fully in the chapter dealing with the physical condition of the shooter.

The great desideratum in learning to aim well is to secure uniformity. No matter what method of those about to be described is adopted, if the aim is always taken in exactly the same manner, any habitual error whether vertical or lateral can be corrected by appropriate adjustment of the sight.

It is often said that there is only one right way to do a thing; and the quoter as a rule would have others believe that his way is that way. Disclaiming any intention of being egotistical, I will describe the way I have found to give me the best results first, and then try to explain other ways of aiming.

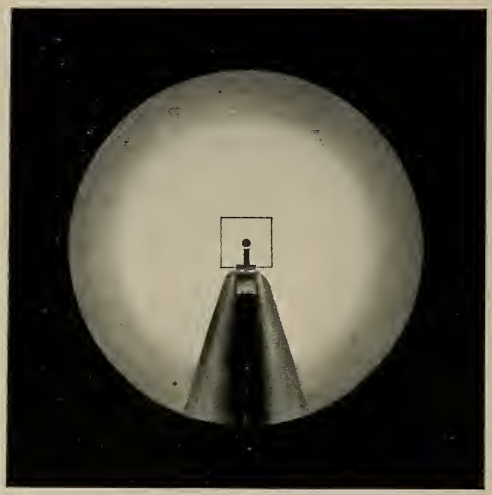


FIG. 15.

APPEARANCE OF SIGHTS WHEN A PERFECT AIM IS SECURED.
(MORE OF THE BARREL SHOWS IN ILLUSTRATION THAN IS SEEN IN AIMING.)

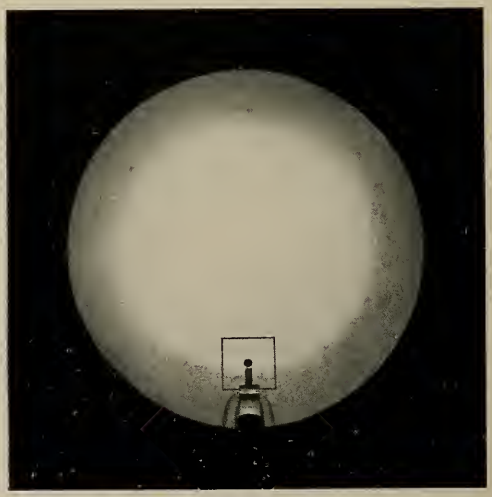


FIG. 16.

WRONG METHOD OF SIGHTING.

If a rifle with a peep sight—and practically all of those which riflemen in this country have to deal with have peep sights—be brought to the shoulder and trained upon the target, it will be at once noticed that all three objects—front sight, rear sight and bullseye—cannot be seen clearly at the same time. If the eye be focussed on the rear sight, both the front sight and bullseye will be blurred. If the eye be focussed upon the bullseye so as to see it clearly, the rear sight will be blurred very much, and perhaps the front sight may blur a trifle, but not sufficient to make it indistinct. This is because the eye has to focus itself for each distance, and cannot maintain two focusses at once.

But the rear sight does not have to be seen in sighting. The rear sight is put there for the purpose of indicating a certain point of alignment, and that point is in the centre of the aperture. Therefore, all that is necessary is to be certain that we see the top of the front sight through the centre of the aperture, and after that we may disregard the rear sight. In Fig. 15 I have shown approximately how the sights appear to me when I have a perfect aim. Notice how large the rear aperture appears, owing to its close proximity to the eye—a penny, held close enough to the eye, will obscure the whole world. The aperture of the rear sight is not seen clearly, but the blurred outlines can still be appreciated, and the head moved about until the tip of the front sight is brought into the centre. Then the gun is moved until the top of the front sight just touches the lower edge of the bullseye, when the aim is considered to be perfect, as shown in Fig. 15.

Some riflemen prefer to leave a little patch of white between the top of the front sight and the bullseye; others aim at the white target at one side of the bull,

and still others select the top of the target frame to aim at. But whatever point is taken, it matters little so long as the same sight is taken at each shot. The method first described is the best one to learn, because it is the way one would use his rifle in actual service; and most of our best shots shoot in that way at the target.

If target sights are used, the rear sight will be used in the same way, but if the front sight is fitted with an aperture disc, it will be made to encircle the bull and the spirit level will aid at the same time in obviating any tendency to cant the gun to either side.

I believe it is a mistake to draw the tip of the front sight down into the bottom of the rear aperture, as some military riflemen do. (Fig. 16.) In this case, the light that is utilized is going not through a round hole as in Fig. 15, but through the space formed by the intersection of two circles, one circle being the edge of the aperture, and the other the outline of the pupil. In other words, by this method the eye is drawn down until the upper margin of the pupil almost touches the lower edge of the aperture, and the aim is being taken through the narrow slit thus formed. The result is that nothing is seen so clearly as with the first method.

Drawing the front sight into either the right or left side of the aperture is an error too obvious to require more than mention. Experienced riflemen soon learn to avoid it, as it causes shots to strike to the right or left.

Canting the rifle to either the right or left is probably the most common fault in aiming leading to lateral errors; therefore the rifleman should closely watch for any tendency toward this fault. Like all errors, its

bad effects are most noticable at the long ranges. On a rifle fitted with target sights, the spirit level will of course immediately show the least canting of the gun; but in using the military rifle it is necessary to acquire the habit of always holding the piece upright. There is one point, though, that I have found of great help in acquiring this habit, and that is, to take advantage of any perpendicular object down the range—flag pole, or whatever it may happen to be. After the sights are fairly well aligned, if the head be moved a little to one side, the side of the rear sight leaf may be paralleled with the perpendicular object; and this can be repeated every shot until it is found unnecessary. Once the rifleman acquires the knack, it is surprising how habitually the sight leaf will parallel with perpendicular objects.

CHAPTER VIII.

HELPS TO GOOD AIMING.

There are certain little changes and improvements which the rifleman may find it profitable to make in his sights, the same as described in the chapter relating to selecting and improving the rifle. In the first place, the peep hole or V of the rear sight may be smaller than some shooters can do the best work with. On the Krag, the peep as issued is generally too small. It was just about right on the old 45 calibre Springfield (Buffington) sight. Before enlarging the hole, however, it is a good plan to borrow various other rifles on which the sights have been enlarged, so that you can form some idea of what size hole will suit your own eyes best; for some men do the best work with the very small aperture with which the sights are issued. If you find that you can aim better with a larger opening, the best way to enlarge it is by means of one of the small reamers used by watchmakers. These are generally tapered, and by passing one into the aperture you have found to be correct, and noting how far in it will go, you can ream your own sight to the same diameter if you are careful to run the reamer in to the same distance. If the reamer leaves any burr on the edge of the hole, it should be removed by means of the rat-tail file. The reamer should be passed in such a direction that the (tapered) hole will be larger toward the target.

If it is desired to enlarge the V, it is best to do it by means of the rat tail file. A U makes a far better notch to aim through than a V, and it should be kept as near to a semi-circle in shape as possible.

After these alterations, the sights should be removed from the rifle and the part that has been cut heated in the flame of a spirit lamp or bunsen burner until the glitter of the metal is replaced by the dark blue of oxidation. No one can do the best work with a rifle if the sights themselves show luminous surfaces or points, which send extraneous rays of light into the eye of the shooter. Both front and rear sight should therefore be as near a dull black as they can be made. For this purpose, a simple expedient consists in smoking the sights—both front and rear—and the most suitable material for furnishing the smoke is camphor. A small lump of this substance, carried in a primer box, furnishes a means when ignited of covering the sights with the most dead black coating that can be desired.

The difficulty of igniting the camphor, when there is much wind blowing, and the liability of the camphor soot to be rubbed off, have led to the introduction of various liquid preparations for blackening sights. Some of these are given in the appendix. No doubt some of our American riflemen will soon develop for themelves still better preparations of this character. All that is really necessary is a dead black paint that possesses very quick drying properties, and has sufficient body to blacken metal with one coat.

Some British riflemen use a small dot of white on the front sight, but I do not believe this affords any advantage on our rifles. The British rifleman is forced into many artifices in the way of painting in black and white on his sights, because the British service rifle is not provided with a wind gauge and even its V is improperly aligned; so the British rifleman turns his sight bar upsidedown, paints it black, and

then makes a white line over which he aims instead of using the V. By placing the white line to the right or left of center, the effect of a wind gauge is obtained. Good work can be done by this method, but let us thank the good Lord that we have an effective wind gauge on our rifles.

The next point that requires looking after is to be certain that the sights are immovable when set for any given range. On the Krag sight the little steel plate containing the peep hole is often loose and free to move both vertically and laterally to a limited extent, no matter how firmly the thumb screw is tightened; and the jar of firing does actually move it, differently for each shot. Many a good rifle has been condemned when the trouble was with the sight. If you cannot remedy this defect yourself, take it to a gunsmith—but get it fixed somehow.

The leaf itself sometimes wears loose at its joint with the sight base, although this is not likely to be the cause of much error owing to the strong spring which would tend to always push it into the same position. But I have known of several cases where the whole sight base was loose on the barrel, and could not be tightened because the holes in the barrel were not deep enough for the screws. This can be remedied by taking out the screws, holding them in a vise with leather jaws, and filing off some of their length. Another way is to insert a piece of paper between the barrel and the sight—or several pieces, if one is not thick enough. But this impairs the correctness of the graduations, which are none too correct to begin with.

For delicate vertical adjustment of the rear sight, the various verniers and micrometers made for the purpose are very useful. In Fig. 12 two kinds are

shown. One (a) is made in England, for the British service rifle, but it works well on our 1901 model sight also. The other, (b) was designed by H. M. Pope especially for use on our own sight. It is much lighter than the British instrument, being made of steel instead of brass, and has the further advantage that the rifle can be shot without taking it off if desired. Both forms can be applied to the sight or detached in a second. They have the advantage that the graduations are so spaced that each count is equal to one minute angle of elevation, which means 1 inch for each hundred yards of range. Thus, if the shots are grouping 30 inches low when shooting at 1000 yards range, by raising the sight adjuster 3 points this will be exactly corrected. At 500 yards, each point equals 5 inches; and so on.

Once the correct windage and elevation are found, the sight should be firmly secured in place, so as not to be affected by the jar of firing. In military competitions, the rules will generally require that the sight adjuster be removed from the gun; but if Pope's is used, it may be left on until that time, greatly facilitating the "sighting in" of the rifle. The slide can be made sufficiently tight by means of the thumb screw, but the cam provided for fastening the wind gauge can seldom be moved with sufficient power by the fingers alone. The head of a cartridge, however, enables one to apply much more power to it, and it is a good plan always to fasten it by that means.

A sight adjuster for moving the wind gauge is still to be desired, but has not yet appeared on the American market. A rifleman with some mechanical ability could readily convert one of the British adjusters to that purpose, but I do not know of its having been

done up to this time. In using the sight adjuster, it is well to bear in mind that each point on the wind gauge is equal to about 6 points on the adjuster.

Having by observing the foregoing details secured a perfect aim, there yet remains to be done what is for many persons the most difficult thing of all—pulling the trigger. How easy it sounds to say it! Of course, any one can pull the trigger—but how many can do it in just the right way, and just at the right time? It matters not how perfect the aim, nor how careful the calculations, if that aim is not maintained at the moment of pressing the trigger,—"it availeth nothing."

There is in every human being the instinct to involuntarily brace one's muscles against the expected recoil. But this muscular contraction is very apt to anticipate the discharge of the gun, imparting to it a movement that totally destroys the aim. Even the best of rifle shots are at times affected by this tendency to "flinch," as it is called; and the only way to overcome it is by constant practice and strong exertion of the will. The first step to learn is to pull the trigger steadily—not give it a jerk, as the tendency is with the novice. The pressure should be gradually increased by closing the hand, until sufficient force is applied to discharge the gun. Some military men pull with the middle finger, but I firmly believe that the index finger is far better, because it is capable of finer education. Whatever method is used, an important gain will be made by the novice when he feels able to "call his shots"—meaning that he knows where the sights were aiming at the instant of discharge; and this can never be acquired while one is flinching. It is impossible to keep a record of what the rifle is doing until one learns to "call his shots."

Some advise that the pressure be applied to the trigger so gradually that the shooter will not know when the discharge will take place. Mr. Tippins called this an attempt to cheat a man's instinct rather than overcome it, and considers it bad advice; and I agree with him. You cannot apply the pressure so gradually that the instinct will not learn in a few shots just what pressure will discharge the gun; and the only way is to conquer the fault by sheer force of will, so that the rifle may be discharged without the aim being disturbed. Considerable practice may be had by snapping an empty rifle* at a small black spot across the room. Once the flinching is overcome in the off-hand position, it is not likely to be troublesome in the lying down positions. But, after all, success in this as in other things will only come by "keeping everlastingly at it."

*Be sure the rifle *is* empty before you snap it. Don't think so, or take it for granted—open the action and look. More accidents happen with the "Didn't know it was loaded" weapon than with all others put together.

CHAPTER IX.

POSITIONS IN RIFLE FIRING.

Rifle shooting is generally practiced in certain prescribed positions, depending on the distance. It is important at the outset to acquire good positions for each range, for faulty ones are easier to learn than to unlearn.

At 200 yards the offhand or standing position (Fig. 17) is generally required, both in military and match rifle shooting. It is the most difficult one in which to hold steady, and requires the most practice to become expert in, so far as good holding alone is concerned.

By the offhand position is meant standing, with neither the gun nor the body resting upon or against any artificial support. But it is not required that the shooter shall adopt the shotgun position, with the left hand fully or partly extended. The physique of some men makes this the easiest position for them, but others can do far better work with the left arm close to or against the body, and it is permissible and entirely within the rules for them to shoot in that way if they prefer it.

The various illustrations which constitute Fig. 17 show the various modifications of the offhand position used by different riflemen. Some are more graceful than others. Good scores, however, are not made by dainty posing, but by steady holding. Therefore, having by careful trial of all positions found that in which you can hold the rifle steadiest, even though it is a little less graceful than some other, don't let anyone induce you to change it.

FIG. 17.

FIG. 17.

FIG. 17.

FIG. 17.

Practice with the target or Schuetzen rifle is particularly valuable in acquiring skill in the offhand position. One who has become even a fair shot with the latter weapon can generally do surprisingly good work with the military rifle at 200 yards. The reason is that the Schuetzen rifleman has trained himself to hold for the center of the bullseye (See targets, Fig. 21) while the military shooter does not care whether it is the centre or the margin, so long as he hits the bull. It cannot be denied, however, that the importance of the offhand position is taking a secondary place to those adapted to long range work; for although the quickest position to assume, and perhaps the most used in the battles of former times, the increasing importance of long range shooting is slowly forcing offhand practice into the background as viewed from the standpoint of military usefulness. Nevertheless, in many important matches there is a 200 yard stage, and for this reason it behooves the rifleman who aspires to honors in the sport to practice it steadily and earnestly, and I can confidently assert from personal experience with both military and target weapons that nothing so thoroughly developes one's skill in holding in the offhand position as practice with the Schuetzen rifle.

Shooting at 300 yards may be regarded as distinctively military, for this distance is not used in any other branch of the sport. The nearest approach to it is the 300 metre distance in vogue among a few of the German and Swiss shooting societies in Europe, but so far as I can learn it is not a popular range and is gradually giving way to those in more general use. But the 300 yards range is decidedly important to the military rifleman, for it is here that part of his qualification as marksman is earned.

FIG. 17.

At 300 yards the sitting and kneeling positions are prescribed in the National Rifle Association rules, although some states permit the use of the prone position at this distance in class practice. The sitting position comes very easy, as a rule, to persons of slender build, but the stout rifleman generally has difficulty when he attempts it. It is much steadier than the kneeling position, once it is acquired; but the kneeling position is much more easily and quickly taken, and for that reason should be practiced. The right knee should be about at right angles to the line of fire, and a boot with a strong thick sole enables the rifleman to adopt what is really a partly sitting position, using his right shoe for a seat. Keep the left foot well forward, so that the left leg and forearm may form a nearly vertical column, which is most suitable for steady support.

The sitting position depends so much on one's physique, that more can be learned by studying the illustrations (Fig. 18) and practicing by snapping the empty rifle in various modifications that feel comfortable to the rifleman, than by any description I can give. I myself am not of stout build, but I never yet have been able to get into a sitting position in which I could do work satisfactory to me; and yet some riflemen take to it like a duck takes to water. There are not many matches in our annual competitions in which shooting is done at 300 yards, but it should nevertheless be practiced; for lack of familiarity with the necessary positions is liable to result in a most mortifying score at a critical time, as the bullseye is smaller in proportion to the range than at any other distance the rifleman is called upon to shoot.

FIG. 18. SITTING POSITION.

FIG. 18. KNEELING POSITION.

FIG. 19. PRONE POSITION.

The Prone position (Fig. 19) is perhaps the most popular of all—certainly so for military rifles. It is permitted at all ranges of 500 yards and over, and the majority of military riflemen use it even at the longest ranges. Therefore, it will well repay the novice to devote considerable time and attention to attaining a good prone position. The body should not lie in a direct line with the target, but the legs should be thrown to the left and stretched comfortably apart; most experienced shots lie at an angle of about 45 degrees with the line of fire. Also, keep your rifle and all parts of your body as close to the ground as possible. Hold the rifle firmly with the left hand, which should be as far forward as comfortable, with the sling strap loop slipped two-thirds of the way toward the shoulder from the elbow. On the Krag, the sling should be fastened for the prone position to the front and middle swivels, and both ends of the loop should pass around the forearm just back of the wrist. The length of strap which it is necessary to let out in order to do this will vary some in individual cases, and new holes will perhaps have to be cut in the strap for the hook. The average man requires the hook for prone shooting to be inserted about 7 inches from the end of the strap, but long or stout arms will require greater length. Using the strap is a great help to steadiness in this position, although the novice may not at first appreciate it. It requires some little practice and some adjustment before all the benefits of the sling can be felt. Hold the rifle firmly against the muscles of the shoulder, and not against the collar bone. With the 45 calibres, as one becomes bruised from the recoil, there is strong temptation to "distribute the agony" as one rifleman expressed it, by applying the butt to a different part at each shot. This

FIG. 20 A. BACK POSITION USING TARGET SIGHTS.

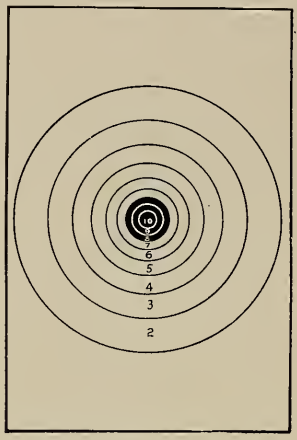
leads to irregular shooting. With the 30 calibres the recoil is not severe enough to cause trouble of this kind, and with the older weapon it is better, until the shoulder becomes toughened to the work, to sew a layer of thick felt inside of the clothing where the butt of the rifle is held.

The great point in acquiring a perfect prone position is to find one that is low and comfortable, so that one does not have to shift about continually. Other details which conduce to comfort are the finding of a soft spot on which to rest the elbows, avoiding any slippery material like a rubber blanket, very little slip of the elbow being sufficient to score a clean miss. Equally to be avoided as elbow rests are the rough rope mats in use on some ranges—the elbows will get sore enough at first without rasping them on a rough surface. Then again, much unnecessary reaching and moving about can be avoided if the rifleman will, before lying down, so dispose of his outfit that everything is within easy reach. Try to find an arrangement that is convenient, and then always follow it systematically.

The various back positions are permitted at ranges of 800 yards and over. They are undoubtedly the steadiest of all, and most of the long range match rifles are shot in that way (Fig. 20, a). The Krag can also be shot in this way, but if used with military sights the rear sight is too far away from the eye for comfort. With target sights it is all right. A particularly comfortable and steady position for the military rifle is that known as the Texas Grip (Fig. 20, b). The old 45 calibre Springfield is well adapted to this position, and in it can be manipulated with an astonishing degree of accuracy and rapidity. The Krag,

FIG. 20 B. TEXAS GRIP.

however, does not fit the Texas grip position so well. Its bolt handle is in the way, and it has always seemed to me that it does not shoot as accurately this way as it does in the prone position, probably because of interference with the flip of the barrel. Nevertheless, some riflemen use this position by preference even with the Krag. Besides being steadier, it brings the left arm in such a position that it acts as a pillow for the head, relieving all strain upon the muscles of the neck, so noticeable in the long range back position. It also causes the sling strap to take up all of the recoil, transferring it to the thigh, where recoil is unnoticeable.

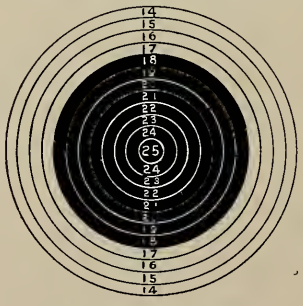


STANDARD AMERICAN TARGET.

The present dimensions of the Standard American target are as follows:—

DIAMETER OF CIRCLES.		WIDTH OF RINGS.	
10 circle,	3.36 inches		
9 "	5.54 "	9, 1.09	inches.
8 "	8 "	8, 1.23	"
7 "	11 "	7, 1.50	"
6 "	14.80 "	6, 1.90	"
5 "	19.68 "	5, 2.44	"
4 "	26 "	4, 3.16	"
3 "	34.22 "	3, 4.11	"
2 "	46 "	2, 5.89	"
1 Balance of target, 4x6 feet.			

The 8, 9, and 10 comprise the Creedmoor bullseye; 4, 5, 6, 7 the centre, counting 4; 2 and 3 the Creedmoor inner, counting 3. The 1 same as the outer, counting 2.



GERMAN RING TARGET.

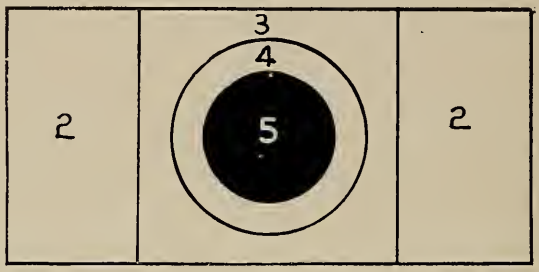
FIG. 21.

CHAPTER X.

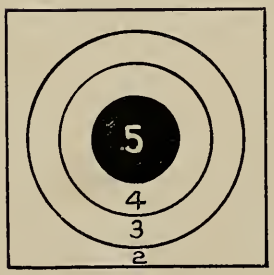
TARGETS IN GENERAL USE.

Many targets have been devised since the advent of rifled firearms, but fortunately few of them have survived. I say fortunately, for the most desirable thing about any target is that it shall represent some standard design that is uniformly used by shooters throughout the country, and at standard distances. For only in this way can skill with the rifle be compared, and a record kept of the performances of different riflemen at different times and places.

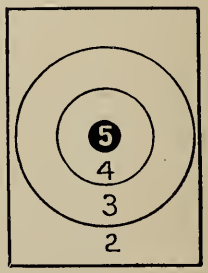
At the present time, the Standard American and the German Ring targets (Fig. 21) are by far the most commonly used by the 200 yard civilian riflemen; although, in some of the German American shooting festivals some other designs are introduced for variety. The Standard American has the advantage that its 2, 3, 4 and 8 rings coincide with the 2, 3, 4 and 5 rings on the National Rifle Association military target for use at the same distance, and therefore the same target can, if desired, be used for both military and match rifle shooting at 200 yards. But the match rifle shooters generally prefer to extend the bullseye so as to include the 7 ring, which military men object to, and therefore separate sets of targets are run for each style of shooting, as a rule. There can be no objection to thus enlarging the black, however, as the dimensions of the circles (on which the value of the shots is based) remain unaltered. Some riflemen prefer the 8 inch black for both kinds of shooting, but there are some with poor eyesight who find the 11-inch bullseye easier to shoot at. The diameters of the various rings are given under the illustration.



First-class, 6 x 12 feet.
Bullseye, circular, 36 inches in diameter.
Centre, " 54 " "
Inner, square, 6 x 6 feet.
Outer, remainder of target.



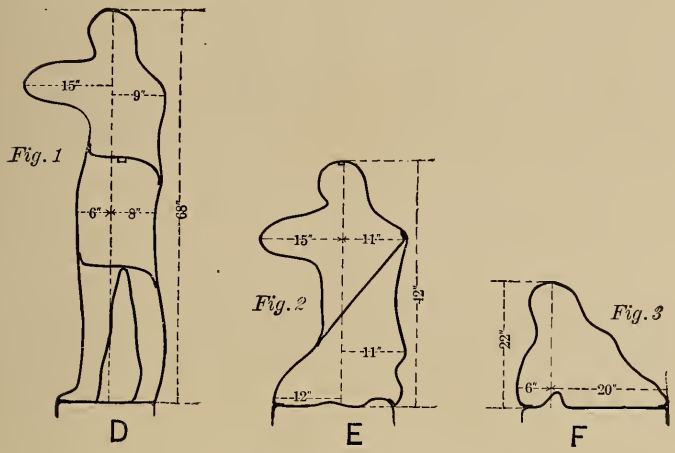
Second-class, 6 x 6 ft.
Bullseye, circular, 22 ins. in diam.
Centre, " 38 " "
Inner, " 54 " "
Outer, remainder of target.



Third-class, 6 x 4 ft.
Bullseye, circular, 8 ins. in diam.
Centre, " 26 " "
Inner, " 46 " "
Outer, remainder of target.

NATIONAL RIFLE ASSOCIATION MILITARY TARGETS.

FIG. 22.



FROM BLUNT'S MANUAL.

FIG. 23.

Targets for military use have undergone several changes in the past 25 years. At present the National Rifle Association targets (Fig. 22) are in the most general use, although the eliptical Blunt target is still used to a limited extent. For skirmish firing, the silhouette targets (Fig. 23), consisting of 3 silhouette figures representing a standing, kneeling and lying man, are used.

It is to be hoped that the National Rifle Association will be able to bring about more uniformity still in the targets used in various parts of the country. The N. R. A. targets (Fig. 22) certainly fulfill all requirements for military match shooting. The 1st class is for distances of 800 to 1000 yards, the 2nd class for 500 and 600, the 3rd class for 200 and 300.

TARGET G.

COMPANY SKIRMISH FIRING.

TARGET H.

COMPANY FILE FIRING.

FROM BLUNT'S MANUAL.

FIG. 23.

In my opinion, the skirmish targets defeat the object for which they were designed by reason of their color. We are never likely to be called upon to fight negroes in black uniform, and therefore the practice in skirmish firing, teaching men to estimate distance by the appearance of these black silhouette figures, is sure to inculcate false ideas. And it is always harder to unlearn a false idea than to learn a correct one in the beginning. All armies of the future are likely to wear khaki uniforms, and for that reason the silhouette targets should be so painted as to correspond therewith in color. This, too, would give the opportunity of forming an idea of the merits and demerits of the various telescopic sights and similar appliances, which cannot be done when the shooting is carried on at black objects outlined against a white background.

I have cut this description of targets rather short, for the reason that I do not believe it will profit the novice to read detailed descriptions of the various little used or discarded ones. To those so inclined, I can refer to Mr. A. C. Gould's book, "Modern American Rifles," which goes into the matter of targets very thoroughly. What we want at present is more riflemen to shoot at the targets we have; and anyone who endeavors to foist upon us new target designs I always feel inclined to regard almost as a malefactor.

A. .30 CAL. U. S. GOVERNMENT CARTRIDGE.

B. .30 CAL. NEW SPRINGFIELD CARTRIDGE.

C. .32–40 CARTRIDGE.

D. .38–55 CARTRIDGE.

E. .32 IDEAL CARTRIDGE.

F. .45–70 CARTRIDGE.

FIG. 24. CARTRIDGES OF SPECIAL INTEREST.

CHAPTER XI.

AMMUNITION.

It can hardly profit the novice to rehearse the enormous strides that have been made during the past 50 years in the development of ammunition. In its present form, the metallic cartridge probably represents as near a perfect type as can be hoped or desired.

The modern rifleman will have the choice of two kinds of ammunition, the strictly modern, using metal jacketed bullets and smokeless powder sufficient to develop very high velocities, and the familiar black powder and lead bullet cartridge—the latter, however, capable of being modernized to a certain extent by the use of suitable smokeless powder.

For target rifles intended chiefly for 200 yard shooting, the old style of ammunition is in some ways preferable. It is much cheaper to reload, not only because black powder is cheaper, but also because the common lead (or lead and tin) bullets used can be moulded by the rifleman himself, at a cost of approximately 5 cents a pound; while the high power jacketed bullets must be bought, and they are the most expensive item in modern long range ammunition.

The cartridges (Fig. 24) best adapted to the Schuetzen rifle are the 32-40, (c,) 38-55, (d), and 32 Ideal (e). All of these are extremely accurate, and can be reloaded by the rifleman many times; so that the cost of the most expensive part of a cartridge—its brass case—is eliminated. In loading cartridges for this

L. of C.

kind of shooting, the most expert shots always put only powder into the shell; a blotting paper wad is sufficient to hold it in place, and the shell can be filled to its mouth with powder. The bullet is seated in the rifling separately, either by means of a special tool made for the purpose by the Ideal Manufacturing Co., New Haven, Conn., or in the case of the finest Pope barrels the bullet is pushed down from the muzzle into a position just ahead of the chamber. The finest shooting of all is done by the latter method, for not only is the advantage gained of having the bullet already in the rifling when the explosion takes place, but the seating of the bullet from the muzzle practically cleans out all fouling, or at least pushes it behind the bullet where it does no harm.

The shells should be decapped as soon as possible after firing, and then cleaned by means of the solution whose formula is given in the appendix.

The most popular powders for Schuetzen rifles are, the L. & R. Orange Rifle, Hazard's FG, and King's Semi-smokeless FG. With the ordinary factory barrel, however, the L. & R. "Sharpshooter" Smokeless gives as great accuracy as either of the others, and has the advantage of being smokeless and developing only about half the recoil.

The moulding of bullets, as well as other details of loading these cartridges, are well explained in a small book entitled the "Ideal Hand Book," which is really the catalogue of the Ideal Mfg. Co.; this company makes all kinds of loading tools and other useful articles for the rifleman, and it will well repay the novice to send and obtain a copy of it.

The 45-70 cartridge (Fig. 24, f) is still widely used in military arms, although it is to be hoped that

before long it will be entirely superseded by a single standard cartridge. For target shooting up to 600 yards, however, it is still nearly capable of holding its own against the newer ammunition, although the rapid development of the latter is gradually crowding it out in target competitions. Very great improvement can be made in the shooting of this cartridge if the rifleman is permitted to load it for himself. The bullet does the best work if it is made of 1 part tin to 16 parts lead, and lubricated with a reasonably soft lubricant. The faults with the factory cartridge are generally too soft a bullet, too hard a lubricant, uneven distribution or even omission of the lubricant; and often so much powder is crowded into the shell that in order to seat the bullet and crimp the shell the powder is crushed almost into a solid cake. Mere mention of these faults will put the rifleman on his guard to avoid them. The shell, too, is generally crimped far tighter than necessary, and very little if any crimping should be employed for target shooting, unless required by the rules of the competition—and then just as little as will pass inspection. It is always a good plan, before investing heavily in a supply of factory ammunition, to cut open a few sample cartridges and look for these defects.

The same powders recommended for Schuetzen cartridges will also be of service here. But, with a properly fitting bullet,* the "Sharpshooter Smokeless" is

*When using "Sharpshooter," or in fact any smokeless powder behind a lead bullet, it is imperative that the bullet be of sufficient size to fit the barrel to the bottom of the rifling. Otherwise the escape of the hot gas past it will melt and deform the bullet, and render accurate shooting impossible. The U. M. C. Co. make a bullet of the proper size for the .45 calibre when using "Sharpshooter" powder, and also furnish it in complete cartridges. The diameter should be .460 inches.

far ahead of all others for this cartridge. It developes less chamber pressure for the same velocity, is smokeless, and its recoil so noticeably less that it enables the rifleman to make a much better score. It also, by its smokeless qualities, gives the soldier armed with what our President has so aptly termed the "archaic weapon" some slight chance in a fight with troops armed with the newer weapon. 20 grains of "Sharpshooter Smokeless" is the amount necessary to develop the standard velocity.

Turning now to the high power cartridge, we find that the long, jacketed bullet is what gives it its chief characteristics, because while it would be possible to put powder enough behind the ordinary bullet to drive it at the same velocity, the lead alloy is not hard and tough enough to hold on to the rifling—it will strip. The powder, too, is of a special grade, best adapted to imparting the high velocity without excessive pressures, and the bullet, being long and heavy for its diameter, maintains its velocity well. But it takes a large charge, even of smokeless powder, to develop 2000 or more feet per second velocity, and for that reason these cartridges are as a rule made with a large powder chamber—are bottle necked.

The particular high power cartridge which has been developed to the highest degree in this country is the 30-40. (Fig. 24, a). It is the cartridge that is adapted to the Krag, and for that reason is known as the 30 cal. U. S. Government cartridge. The first American ammunition of this character, in common with other sizes of high power ammunition, was simply abominable. But great improvements have been made in this cartridge, especially within the past year, which place it in the lead of all of the high power type made in America.

The changes which have brought about this recent improvement have chiefly been in the bullet. The powder that was found best in the beginning still remains far in the lead, and appears to be as nearly perfect as anyone can reasonably ask. I refer to the "W. A. 30 cal." powder, as now made in tubular grain by the L. & R. Powder Co. There really is no choice for us Americans but to use this powder, for no other product—American or foreign—has so far found its way into the market that can hold a candle to it for accuracy and all around good qualities. The Cordite, so highly extolled for use in the British rifle, gives poor accuracy in ours, and leaves its usual corrosive residue. The other foreign powders either do not give anything like the accuracy the "W. A." does, or are totally unfitted for use in the Krag by reason of the excessive pressures developed. The chief objection to other American powders that have so far appeared has been the large amount of fouling left in the gun, packing down into the grooves and destroying all accuracy. This does not happen with the "W. A." and the rifle shoots with as good accuracy after 100 rounds have been fired as it does after 5.

The secret, then, of good shooting ammunition for the American rifle of 30-40 calibre is to obtain good bullets. Good powder, shells and primers can be obtained in any amount. But until the summer of 1902 we were unable to procure good bullets, and, in fact, were not even certain until then that the chief source of our trouble was in the bullets. At that time, with an important international match on hand and none of our ammunition giving really satisfactory results at the long ranges, I wrote an appealing letter to Mr. W. M.

Thomas, the ballistic expert of the Union Metallic Cartridge Co., telling him of our troubles, and how we had experimented with everything else, but that it took a cartridge factory to conduct experiments in the production of metal jacketed bullets. Mr. Thomas agreed to help, and the result of his efforts was the production of the first really satisfactory bullet of this character we have had.

This bullet, which is known as the Thomas' bullet among riflemen, is perfectly smooth, without any canelures for lubricant* or crimp. It has a well formed base, which is not concaved, and the metal jacket at the base is turned in quite sharply, so as to form almost a square edge. Mr. Thomas's attention having been called to the fact that nearly all the rifles we had to shoot with were above the standard diameter (.308 inch to the bottom of grooves) while all of the bullets were smaller in diameter than the standard, gratified us by making the new bullet to a standard of .3085 inch. The shape was altered slightly, and some other changes made in the process of manufacture, the nature of which I am unable to state; but the advent of

*When we first began to shoot with the high power rifle, the urgent need of a lubricant to prevent the hard jacket from wearing out the barrel so rapidly appealed to all riflemen. The need is as great now as ever, but the difficulty is that a hydrocarbon lubricant applied to a high power bullet does not lubricate. For, owing to the high temperatures developed, the lubricant undergoes chemical disorganization—is split up into its constituent elements, carbon and hydrogen. The hydrogen being a gas, escapes, leaving the carbon behind; and carbon, far from being a lubricant, only adds to the fouling of the gun.

Therefore we have totally discarded the use of lubricant on high-power bullets, and never use it except when compelled to shoot with the ammunition of government manufacture, which has Japan wax and graphite applied to the bullet, not so much for lubrication as for water-proofing.

the new bullet marked a new era in our long range shooting, for the misses became infrequent even at the longest ranges and the scores suddenly jumped to a standard that had never before been reached except with match rifles.

Since the success of the new bullet has become so evident, other manufacturers have made earnest efforts to improve their product. The new smooth Winchester bullets are a distinct advance, and the latest smooth bullets being manufactured at Frankford Arsenal are said by some riflemen to be very near perfection. Time and the experience of the shooting fraternity will doubtless result in the selection of the best of these for common use, but a majority of the riflemen with whom I have conversed on the subject say they are "well satisfied with the Thomas," and "not likely to change unless someone else proves that a better bullet can be had." And we must not forget that the American rifleman owes a debt of gratitude to the Union Metallic Cartridge Co. and its skillful employee in coming to our aid at a time when we were really in a bad predicament.

What are the requirements of a good bullet? I hear someone say, "It must shoot straight"; but that is begging the question. It is true that some bullets that appear perfect to a casual examination may fail signally at the target, but there *are* some indications that are useful in making a selection.

It may be assumed that the cartridge company or arsenal will select the material and alloys which it believes to be best suited for the purpose. This being so, the first thing the rifleman should investigate is the diameter of the bullets, both as to uniformity and adaptability to his particular rifle. Any batch of bul-

lets that shows a variation of more than .0002 or .0003 inch should be rejected, for more uiform lots can be obtained. If one's rifle calibrates .3085 or .309, (and there are lots of them that are even much larger), he should search for bullets that approach more nearly to the calibre of his rifle. It is better to have the bullets a little too tight than too loose, for reasons already mentioned. These measurements are to be made by means of a good micrometer, and with great care. Next, examine the base. It should be perfectly formed, and the long axis of the bullet should be perpendicular to it. Opinions vary as to whether the base should be rounded or not, some claiming that it weakens the jacket to turn it in too sharply. It probably matters little, so long as it is of such shape that, at the instant of issuing from the barrel, the powder gases are not allowed to escape sooner or faster on one side of the base than on the other. This is an extremely critical time in the discharge of a rifle, and it is probable that more than half of the trouble with unsatisfactory bullets originates at this point; for the gas escaping more on one side than the other drives the base of the bullet with great violence toward the opposite side. This is called *imperfect delivery,* and we must have perfect delivery to get accuracy.

Having calibrated the bullets, next weigh a number of them. A difference of a grain either way from the standard will not matter, but if they show a greater difference than this it is best to look for a better lot. It is not that slight differences in weight are liable in themselves to cause trouble, the difficulty is that bullets showing these differences are liable to contain air bubbles and an air bubble is seldom accommodating enough to occupy the center of the bullet. If it is on

one side, it will make the bullet lighter on that side than on the other; and instead of spinning on its axis, the bullet will in its flight spin on its false centre of gravity. The result will be a wobbly or "corkscrew" flight, and inaccurate shooting.

The best shells to use are those of Government make, from the Frankford arsenal, if they are obtainable. They seem to be of a more suitable grade of brass than those of private make, probably owing to a higher percentage of copper or better annealing. If primers made without fulminate of mercury are used, the shells can be reloaded from 12 to 20 times before they give out. In some cases they may have to be resized at the neck so as to hold the bullets firmly, but ordinarily this will not be necessary. The tendency of the bullet to slip down into the powder chamber of shells that are enlarged from firing can be overcome by the use of the Ideal shell indentor, and in fact all the necessary loading and reloading implements can be obtained from that concern. Shells after firing should be decapped and washed in the cleaning solution as recommended (see appendix) for black powder shells, unless they are to be fired again within two or three days at the most. In that case the washing can be dispensed with, but any powder will deteriorate if kept long in contact with the residue of previous charges.

There are two makes of primers now obtainable without fulminate of mercury in them. One is the 9½ U. M. C., and the other is the H. .48 primer made by the Frankford Arsenal. They require a somewhat heavier blow to explode them than the ordinary primer, but if the rifleman contemplates using either the Krag or the Remington-Lee he need not worry

about that, as the blow delivered by the firing bolt of either of these is very powerful.

It is difficult to measure "W. A." powder accurately by any of the devices used with black powder; and as it is several times as strong as black powder, it is generally believed that slight variations have great effect. The best plan, therefore, when great regularity is essential (as in long range shooting) is to weigh each charge separately. A form of scales which answers well enough for this purpose is that known as the U. S. Army apothecary scales. It can be obtained from Eimer and Amend, wholesale druggists, Cor. 18th St. and 3rd Ave., New York City, for about $3.50.

For mid range shooting the cartridges can be loaded with sufficient uniformity by carefully dipping the charge by the aid of the scoop furnished with the loading set, or better still by means of the Ideal powder measure of special design made to handle "W. A." powder, 36 grains is the charge that gives the greatest accuracy, although it gives about 2100 foot seconds velocity.

In any case, the scales are almost a necessity, in order to determine accurately how much your measure or scoop is actually delivering; for they do not always do as one expects, and when we are dealing with high explosives it is best to be careful.

While I desire to emphasize the importance of the novice learning to prepare his own ammunition as soon as possible, I believe it would be unprofitable to go into minute details of loading which can as readily be learned from the instructions that accompany the loading tools. Hand loaded ammunition, prepared by the rifleman himself, is always more satisfactory than factory loaded. When you shoot ammunition you

have loaded yourself, you know what is in it; when you shoot somebody else's loading, you only know what you hope is in it. Besides this, it is instructive to attend to all these small things yourself; it impresses upon the mind the importance of that close attention to details, on which we have been harping all through this book.

The new 30 cal. Springfield shortly to be brought out will use the cartridge illustrated in Fig. 24 b. The relative size of the present and the new government shell can be seen at a glance from this picture, as both cartridges were photographed at once, side by side. The new cartridge develops a velocity of 2300 feet per second, as against a standard of 2000 for the 30-40. Whether it will show any increase in accuracy remains to be seen. It is probable that the new rifle will shoot better, however, for besides the improvements in breech mechanism its rifling is to have a pitch of 1 turn in 8 inches, as against 1 turn in 10 for the Krag.

Numerous tests by riflemen have shown that the 10 inch twist of the Krag is insufficient to always carry the bullet steady and point on at the long ranges. When the tipped shots occur, they are likely to miss the target completely; and this is undoubtedly the most frequent cause of the unaccountable wild shots on good holds, that still occur occasionally—though, fortunately, not nearly so frequently as before we had good bullets. I have had a barrel with an 8 inch twist fitted to my Krag, and it seems to entirely remedy the wobbling tendency of bullets at the long range.

This difficulty in the standard Krag *can* be overcome by using a 200 instead of a 220 grain bullet. But the shorter bullet, while giving greater accuracy in

fine weather, is much more affected by wind, so that even with the occasional "unaccountable" most riflemen prefer to use the 220 grain bullet. The possibilities of the 200 grain should be remembered, however, for should an exceptionally quiet day occur he who shoots it would have a great advantage over one provided with only the service bullet.

REDUCED LOADS.

There will undoubtedly arise numerous occasions where one desires to shoot with the Krag or other high power rifle of the same calibre, but where the great energy of its charge would render its use dangerous or impracticable. The use of the rifle for riot service, and for indoor armory practice, may be cited as examples. Then again there are numerous military organizations who do a great deal of practice at 200 yards, reloading their own ammunition for the sake of cheapness—who must do so to keep within their allowance—and to whom the cost of high power ammunition would be prohibitive. To overcome these difficulties I, in common with several other riflemen, have done some experimenting with a view to producing a reduced load cartridge in which a home-made cast bullet could be used, and which, while being accurate at reduced ranges would still be very cheap and capable of being reloaded many times.

For miniature charges to be used in the gallery, at distances under 100 yards, there are numerous bullets that can be used successfully. As usual with smokeless powders, the bullet must fit the rifling to the bottom of the grooves. The cast bullets must be lubricated, but great care is required to keep the base of the bullets clean, for most smokeless powders are affected very badly by grease. The following bullets

have been used successfully by various riflemen for miniature charges: The 32 Smith & Wesson revolver bullet, of 85 grains weight; the 30 Savage miniature, of 100 grains weight; the 125 grain Kephart bullet; and the round ball. In using the lighter bullets, especially the round ball, it is essential that the powder charge shall be small if good accuracy is to be obtained. Three to five grains of "Infallible," with any of the bullets mentioned, make a good gallery load.

Moulds for these bullets can be obtained from the Ideal Mfg. Co. previously referred to. Some riflemen have even had success with buck shot of suitable size, and it can undoubtedly be made to shoot well at very short ranges and with a very light powder charge; it has the advantage of doing away with bullet making, which many regard as an irksome job. But as a rule better results can be obtained from moulded bullets, because the lead used to cast them can be hardened to the required degree by the addition of tin in the proportion of from 5 to 10 per cent. The buck shot should be about .313-in. diameter, and not forced down into the shell, but stuck in the mouth of shell by a light blow from a mallet. When it is desired to produce a cast bullet that will shoot well at longer distances in the Krag—say up to 200 yards—many difficulties are encountered. These, however, have been overcome in a great measure by riflemen of an experimental turn of mind, and without going into details concerning the difficulties encountered in the work, I would say that good results can be obtained up to that distance by the use of the 125 grain Kephart (which is rather light for so long a distance), the 175 grain Ideal bullet No. 308223, designed by the writer, and the 150 grain 32 Remington (Ideal bullet No. 30815).

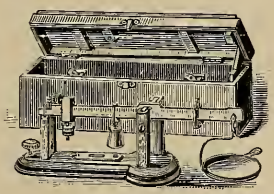
Perhaps the best results so far as accuracy is concerned can be obtained from the last, but in loading it one or two of the grooves containing lubricant must be left projecting from the shell, which is objectionable from a military standpoint. My bullet was designed with other requirements as well as accuracy in view, although it has turned out to be surprisingly accurate in the hands of some riflemen. But military riflemen generally prefer it because the grooves containing the lubricant are covered by the shell, making a clean cartridge to handle, and because cartridges made up with it are sufficiently like the service cartridge in shape and outside dimensions to feed freely through the magazine.

To get the best results from these bullets, it is necessary to harden them by the addition of 15 per cent. of antimony. Antimony is used instead of tin, because tin reduces the melting point of the alloy too much. This makes a very hard bullet, which will stand being driven with a velocity as high as 1200 or 1300 feet per second.

The powder charges which have given me the best results with these medium-power loads are, 8 grains "Infallible" shotgun, 9 grains "Sharpshooter" smokeless, and 12 grains Dupont No. 2 rifle, all by weight. The last is easier to measure, but with it the slightest trace of grease will cause erratic shooting, and the shells must be thoroughly cleaned; while the other two powders can be used successfully even in dirty shells, if not allowed to stand more than a few days before being fired.

On the whole, I believe these medium-powder loads are the best ones to use for armory shooting; for they are not too powerful for use on the usual armory

range—which according to my observation is generally from 50 to 100 yards in length. Being on hand for this purpose, they would be available in case of a sudden call for riot service, and in my opinion are better adapted to such work than the miniature charges, which would be useless beyond a very short distance. It would really appear a necessity that a supply of some such ammunition be kept on hand if our militia forces are to be armed with rifles taking the 30 calibre cartridge, for the great range and penetration of the service ammunition would work such havoc to innocent persons if fired in a thickly settled community as to practically prohibt its use.



MINERS' ASSAY SCALES.

250 by 1-10 grains indicated on the beam. No weights required. Arranged with leveling screw and spirit level. Packed in fine walnut case.

No.		Price.
3054	Without Case	$ 7.00
3056	With Case	10.00

CHAPTER XII.

THE RIFLEMAN HIMSELF.

After all, the personal equation in rifle shooting is what is most important, if one of the links of a chain can be said to be more important than another. Therefore I have thought it might not come amiss to say a few words about what conduces to develop good shooting ability, in so far as my observation has gone.

There are certain individuals who seem to have born in them a special aptitude for accurate work with the rifle, and who require little training or instruction to grasp the whole subject and to keep in trim. These of course will naturally progress much faster than what one may term the average person. Then there are others who seem never to be able to shoot well, no matter how hard they try to learn. But the great majority belong to the intermediate class, and any of them can learn, with perseverance and well directed practice, to become at least fair shots.

Much has been said about the ability to shoot well being due to "strong nerves"—whatever that may mean. Riflemen often refer to an anticipated day's shooting by saying they are "going to try their nerve." According to my observation as a physician, however, nerve has little to do with it. I have had expert riflemen under my care suffering from pronounced neurasthenia—the very word means weak nerves—and they could even during the height of their disorder shoot almost if not quite as well as when they were in good health. We really do not know exactly what physical element it is that is the chief factor in making one an expert rifleman, but I am inclined to think it is a certain education or development of co-ordination more than anything else.

There is nevertheless a great advantage in this, as in other sports, in keeping one's self in the best possible health. Excesses of all kinds should be avoided, and moderate exercise in the open air, if one's occupation is of a sedentary nature, is beneficial in maintaining normal and regular bodily function. One need not have great muscular power to shoot a rifle—there are many expert shots of delicate physique, and there are others equally expert built like a Sampson. Indigestion and constipation should receive appropriate treatment at the hands of a qualified physician, and any other disorders that are in the least degree appreciable should receive skilled attention. This will at least put the novice in a position where he will not start with a handicap.

The use of tobacco and alcohol is a subject in itself. I believe that smoking to excess is detrimental to good shooting, although there are many good shots who use tobacco to a greater or less extent, and a few who certainly use it to excess. No one would think of claiming that they shoot well because of it, and it is very probable that they do so in spite of it; in other words, that they would do better if they cut down on their drug habit. The same may be said of alcohol, except that there are some men who actually seem to benefit by the use during their shooting of a moderate amount of alcohol. From my own observation, I believe that where one's chief difficulty consists in a tendency to flinch, alcohol is of some service; but it never improves the steadiness of one's holding otherwise, and the blunting of the finer senses which are so important in the close study and observation necessary in long range shooting cannot fail to be a detriment. The use of these drugs—and let us always bear in

mind that they are drugs—will have to be determined by each rifleman for himself. It is a safe rule to avoid excesses in either, and never to radically change one's habits just before an important match.

On the day the shooting is to be done, the diet should be light, nutritious and easily digested. Few men can shoot well immediately after a full meal. Strong coffee and tea with many persons interfere with steady holding, and beer and other beverages highly charged with carbonic acid gas are likely to cause discomfort by inflating the stomach and causing undue pressure upon the heart. There is no need of starving one's self, but a small amount of nutritious food and not more than half a pint of fluid make the best kind of a "foundation" to shoot on.

But the greatest necessity of all to the rifleman is good vision—unaided by glasses if possible, but—good vision. Eyes that are good enough (because their possessor knows no better) for every day work are ofttimes unable to meet the requirements of fine rifle shooting. This subject is so important to the rifleman, that it will be profitable to discuss the most common cause of poor vision—refractive errors—so that the rifleman may understand what they are and how they may be corrected.

Anyone familiar with the operation of a camera will readily trace the course of light as it enters the normal eye, represented diagramatically in Fig. 25. The rays

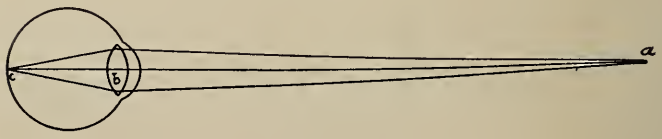


FIG. 25.

of light are here supposed to come from a point (a) 20 feet or more from the eye. Rays from such a distance are so nearly parallel that they may be assumed to be so. The lens of the eye (b) causes these parallel rays to come to a focus at (c), where the branches of the optic nerve are distributed, forming the retina. This is brought about in the same way that the lens in a camera brings rays to a focus on the ground glass, and images are formed in the eye just as in a camera.

If the luminous point be brought nearer to the eye, as represented in Fig. 26, rays from it will be more divergent; therefore, the lens being the same, they will focus at a point (d) behind the eye, and a blur instead of a clearly defined image of the point (a) will result at (c).

In a camera, this would be remedied by drawing the ground glass screen back to (d), but in the eye the retina (c) is stationary, and the focus has therefore to be regained by strengthening the lens (b). This is effected by the contraction of the ciliary muscle, which is not shown in the diagram. When this muscle contracts, it increases the convexity of the lens, and consequently its power, so that rays from the near point are now focussed at (c). This process is called accommodation.

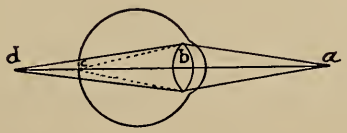


FIG. 26.

In an eyeball that is too short, (Fig. 27), rays from a distant point also focus at a point (d) behind the retina (c). But by means of the accommodation they can be focussed at (c), although only by the expenditure of the necessary amount of muscular power. And if the object is brought near to the eye, then the eye will have to accommodate still more, until that much additional strength of the lens is attained. This is the condition of things in the far sighted eye. It is able to focus objects at various distances upon its retina, as we have seen, but in doing so has to work just that much harder than the normal eye.

The near sighted eye is too long for its refraction. By referring to Fig. 28, it will be seen that rays from the distant point (a) are focussed at (d), and by the time they reach the retina (c) they are again out of focus. On the other hand, rays from the near point (e) are brought to a focus on the retina without any action on the part of the ciliary muscle. Thus it is evident that, by accommodating, any point nearer than (e) can be focussed, but those beyond cannot.

FIG. 27.

FIG. 28.

Astigmatism is the defect where the eye differs in different meridians. Thus, in Fig. 29, suppose the eye to be normal in the meridian a—b, and far sighted in c—d. Then when accommodation corrects c—d, it causes a—b to become near sighted. Evidently, then, this defect precludes the possibility of clear vision at any distance without artificial aid. There are various forms of astigmatism, some cases even being near sighted in one meridian and far sighted in another. —"mixed astigmatism."

There is only one way to correct these defects—proper glasses.

The lens of a far sighted eye being too weak for its length, an additional convex lens would be used, of such strength that it and the lens of the eye would together be just sufficient to cause parallel rays to focus upon the retina, without the exertion of any accommodation.

For the correction of near sightedness, advantage is taken of the fact that a concave lens neutralizes the effect of a convex one. Thus, in Fig. 28, the lens (b) is too strong for the distance it is from the retina, since

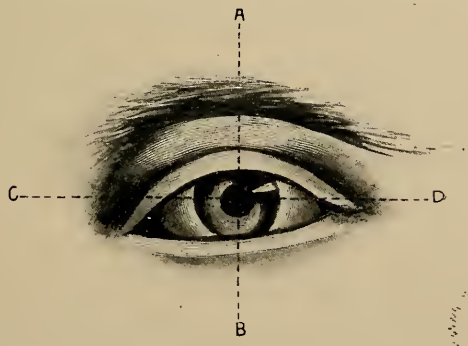


FIG. 29.

it brings the rays to a focus too soon. Therefore this eye would require for its correction a concave lens of such strength that, when so weakened, the lens of the eye would just be able to bring parallel rays to a focus upon its retina, when not exerting any accommodation.

For the correction of astigmatism, a cylindrical lens is used. A convex cylindrical lens is shown in Fig. 30, and would correct the defect illustrated in Fig. 29. The meridian d—e of the lens being convex, would be so adjusted as to coincide with the far sighted meridian of the eye, and the meridian f—g of the lens, being plane, to coincide with the normal meridian. Thus the far sighted meridian would be corrected, and the normal meridian not interfered with.

These errors of refraction manifest themselves by causing pain, fatigue, or headache on using the eyes, or by poor vision. Poor vision as measured by the demands of ordinary life, generally results only when the defect is considerable. But the slight errors, which ordinarily only cause occasional headache and perhaps some discomfort after prolonged use of the eyes, or may even pass unnoticed in every day work, are

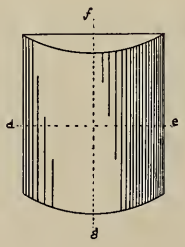


FIG. 30.

quite capable of blurring the sights of the rifle—for sighting a rifle may be regarded as extraordinary work. What generally brings these cases to the physician is the accompanying headache due to excessive work on the part of the ciliary muscle; and indeed it is probable that more than 50 per cent. of all headaches are due wholly or in part to slight refractive errors, especially astigmatism and farsightedness.

A word about obtaining the glasses when they are needed. There are numerous persons professing to prescribe glasses which really requires considerable skill. We find not only oculists (physicians who have especially prepared themselves for this branch of practice), but also jewellers, druggists, opticians and saleswomen in the large drygoods store. However, public opinion is just now undergoing a great change in this matter, for people are beginning to realize that the eye is not an organ to be entrusted to anyone but the skilled oculist. It is not so long ago that the work of the dentist was largely performed by the barber, and it is to be hoped that a similar reform will soon be accomplished in this matter. Even the oculist cannot accurately determine what glass to prescribe for a young person without first suspending the action of the ciliary muscle by means of some suitable drug, and as these are all somewhat poisonous only physicians are allowed to use them.

In target rifles the glass is often mounted in the rear sight cup. There are various ways of doing this, but if so mounted it should be arranged so as to admit of easy removal for the purpose of cleaning. If the defect is at all pronounced, the shooter will feel the necessity of his glass for seeing the target between shots, as well as while aiming, so that spectacles may be preferred.

The variety of lenses technically known as periscopic and toric give the best results for shooting, and indeed for most other purposes as well; but the toric lens is very expensive to make. They are both lenses of the meniscus type, and the advantage in them results from the line of sight, when aiming, passing through the glass more perpendicularly to its surface than is the case with the ordinary glass.

Another helpful point in some conditions of the atmosphere is to have a glass of a light amber color to interpose between the rear sight and the eye. If a refractive error is present, the correcting lens can be made of that color. There are times when, from various causes, the light is very trying to the eyes, and when the use of such a colored glass is a great aid.

The most desirable dress for the rifleman can be summed up in one word—comfort. No high collars, tight fitting belts, tight armholes, trousers, suspenders, etc., should be worn. Breathing and circulation should be unimpeded, and nothing should be allowed in any way to hamper free and easy movement of the limbs, head and body. The fatigue uniform of our army, with its blue flannel shirt, makes a good shooting costume, and for headwear nothing more desirable can be found than the broad brimmed, soft felt campaign hat. Old clothes are always more comfortable than new, and one seems to gain, with time, a certain affection for his old shooting clothes that give them an added value. Elbows and shoulders always have a strong tendency to wear through, for obvious reasons. When they do, patching them with soft leather padded inside with flannel or felt will give them a new lease of life.

The great thing lacking in the uniform as issued is the absence of a sufficient number of pockets. These the rifleman should add for himself, so locating them that they will not interfere with shooting. A watch pocket, one for handkerchief, and others for such odds and ends as knife, keys, money, etc., are almost an absolute necessity for the average American. If the terms of some of the competitions in which one expects to compete call for the service uniform, these pockets should be so placed that they will not cause the uniform to be ruled out. Submitting the proposed changes to the officer who will subsequently have to pass on the eligibility of the uniform will be the surest way to settle this point. But up to this time in all of the important American matches the question of uniform has been entirely subordinated to utility and comfort; and the stiff, natty but uncomfortable new uniform has generally been conspicuous by its absence—another evidence of the practical nature of the American rifleman.

RECORD SCORE 1902
5 MEN 10 SHOTS AT 500 YDS.
NEW YORK TEAM SEA GIRT N.J.
CASEY 5 5 5 5 5 5 5 5 5 5 50
LEVERING 5 5 4 5 5 4 5 4 5 5 47
LOUGHLIN 5 5 5 5 5 5 5 5 5 5 50
DARDINGKILLER 4 5 5 5 5 5 5 5 5 5 49
SMITH 5 5 5 5 4 5 5 4 5 4 47
LAMB 5 5 5 4 4 5 4 5 5 5
TOTAL 250
MADE IN THE
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CHAPTER XIII.

THE NATIONAL RIFLE ASSOCIATION, AND SEA GIRT.

Our National Rifle Association is just now in the position of Rip Van Winkle, awakening from its long sleep. After the Creedmoor and Dollymount matches in the 70's, rifle shooting as a sport practically died out in the United States, except as kept alive here and there by small civilian rifle clubs, who had to furnish all the funds necessary to equip and maintain their ranges, and fight for very existence in the face of popular prejudice against the sport. Why this should have been so is hard to explain, though the decline is by many attributed to the unfortunate controversies that arose concerning the management of the N. R. A. range at Creedmoor, then the only available place where long range shooting could be carried on.

But when the present military authorities came into control in New Jersey, the fraternal spirit manifested toward the civilian rifleman was hailed as an innovation. While the military side of the shooting was of necessity maintained as the chief feature, an organization known as the New Jersey State Rifle Association was formed and inaugurated a series of annual matches, which are held every year at the magnificent range at Sea Girt. The three surviving matches of the old National Rifle Association were taken over and run at the same time as the New Jersey Association matches. Some old riflemen who had almost forgotten what powder smelled like began to revive, and

many young shots began to show an interest in the sport; so that in the summer of 1900, solely through the efforts of New Jersey, interest in rifle shooting had revived to such an extent that there came to be a demand for a national organization to foster the sport.

It was found that the most practicable way to do this was to reorganize the old National Rifle Association, and this was done on December 3rd, 1900. The officers of the reorganized association immediately began vigorous work to further arouse the interest of rifle shooting throughout the country, and to that end revived the international matches between the United States and other countries, which had almost died out of the popular memory. Invitations to compete in an international match were extended to many countries, but the first one to accept and send a team to Sea Girt was Canada, in 1901. In the same year, a match was arranged between the Ulster Rifle Association of Ireland and the New Jersey State Rifle Association, which almost assumed the importance of an international match.

Both of these were long range matches, at 800, 900 and 1000 yards, and we were defeated in both. During our period of hibernation, long range shooting had become almost a lost art in this country; and furthermore, the conditions of the match practically precluded the use of anything except the new high power ammunition, in the development of which we were at least 5 years behind our foreign cousins. Knowing full well that we were doomed to defeat, before a shot was fired, we nevertheless set to work valiantly and did the best we could in the short time at our disposal. For the Irish match, which was open to target rifles, new guns had to be produced. The Remington Arms

Company, with characteristic patriotism, produced in a remarkably short time what is undoubtedly as good a high power target rifle as can be made anywhere in the world; and indeed, the Remington Company appeared to be the only American concern possessing the necessary skill and ability to produce such a rifle. Some thought at the time that we were "out-gunned" by the Irish, but the real truth of the matter is that we were out-ammunitioned more than anything else. With the same rifles, but using the ammunition in the state of development to which we have now brought it, I believe we could win the match. The same thing applies to the match with the Canadians.

In September, 1902, another match was arranged with the Canadians, in the effort to win back the Palma Trophy, which they had carried off as a result of their victory over us in 1901. This match was shot at Ottawa on September 13th, and while we succeeded in beating the Canadians by a comfortable margin, England had a team entered also which won out, beating us by 12 points. But we were not beaten by ammunition this time. Many earnest workers had concentrated their attention upon the ammunition question during the previous year, with the result that our ammunition was at least equal to that of our competitors. There was one cause of the English team winning over us, and that was so plain to those who watched the match that there has scarcely been any discussion on the matter since: they won by their coaches being better able to estimate the conditions than ours were. I have no intention of belittling the ability of our coaches, for they were probably the most experienced riflemen and best coaches in the country. But they (and in fact all of our team) had been on

1902 AMERICAN TEAM OF THE NATIONAL RIFLE ASSOCIATION.

this exceptionally tricky range less than 48 hours before the match commenced, and therefore were far less familiar with the local conditions than were the English coaches, who had spent 3 weeks studying the range. Even this would not have defeated us had the weather conditions on the day of the match been even reasonably good—they were good in the morning, and we profited by that fact to the extent of gaining a lead of 22 points over the English team at 800 yards. But in the afternoon, when the 900 yard stage was about 1-3 completed, very bad weather conditions arose, with rapid changes of light caused by clouds scudding by; the wind came in fierce gusts, veered continually from one point to another, and small but strong eddy currents formed on the range. Under these conditions, with nearly every flag pointing in a different direction, the only reliable way to estimate the wind was by observing the mirage through a telescope trained on the target. This the English team had found in their three weeks' practice to be the only reliable way of gauging the wind on that range, while we were almost totally unfamiliar with the method, and had not even brought a suitable telescope with us. The result was that the Englishmen overcame our lead and gained 12 points on us. At 1000 yards the conditions had settled a little, and we just held our own; but were unable to overcome the 12 points lead.

I have gone thus fully into the cause of our defeats because there seems to be some misapprehension as to the causes which led to them. There is no disposition on my part to detract from the honor due to our foreign cousins in winning these matches. Especially in the last match are they to be congratulated, for the ability to estimate conditions correctly, especially when

they are unfavorable, is one of the most important elements of skill in long range shooting. I cannot help feeling that the results would have been different, however, if we had sent our coaches up there a week or two in advance of the team. That is the trouble with American teams, and always will be—we are so engrossed in business affairs that we cannot spare the time to give that long and undivided attention to a matter of this kind that is required in order to assure success.

Now, the National Rifle Association is to be congratulated for having by its efforts revived these matches. There is even an element of good fortune in our defeats, for nothing so stimulates the Yankee nature to stronger effort than defeat. And not a man who served on the American team of 1902 but is eager for the fray again, for we feel that we have taken our opponent's measure and know that our weak point is capable of being overcome.

The novice in rifle shooting would hardly be a true American if he were not interested in these matches of national importance, and for that reason I have gone into them more fully than was intended. But what I especially want to emphasize is, that it is only through the National Rifle Association that such matches can be brought about, and it therefore behooves every rifleman, no matter how humble, to affiliate with and lend his support to that organization. Full information can be obtained by writing to Lieut. A. S. Jones, Secretary, Passaic, N. J. The dues are only $1.00 per year, and the N. R. A. member has many privileges accorded him that make the $1.00 a very profitable investment. Besides, it will enable him to keep in touch with other riflemen, by which means he

will learn much that is of value; for nearly every old and experienced shot that I know is always willing to help the beginner by advice and often by painstaking instruction. Another means of keeping abreast of developments in the rifle shooting world is to read the papers devoted to the subject. The one that best fulfills the wants of the American rifleman is "Shooting and Fishing," published weekly at 150 Nassau St., New York. Besides much other reading matter of interest to the rifleman, it contains the scores of various clubs and shooting organizations all over the country, and sometimes in foreign countries as well. In fact, for the rifleman who would keep up with the times, it is almost a necessity that he join the N. R. A. and read "Shooting and Fishing."

I feel that this work would hardly be complete to close without some reference to Sea Girt, and the annual meetings of the N. R. A. held there, in conjunction with the New Jersey State Rifle Association matches.

This joint meeting generally takes place during the last few days in August and first few days in September, occupying a week or 10 days. Many prizes are offered, both cash and merchandise, and aggregating several thousand dollars in value. There are both individual and team matches at all ranges, for military and match rifle, revolver and carbine, and the entrance fees in some of the matches are so small that abundant opportunity is offered for even the novice to shoot. Much, however, can be learned by merely watching the keenly contested matches between the experts from all over the country.

Sea Girt rifle range occupies a salubrious location on the New Jersey coast, about 20 miles south of As-

bury Park. It is part of the State camp grounds, and is supported by the military authorities of the State of New Jersey. It is reached by either the Jersey Central or the Pennsylvania Railroad, whose station is very close to the edge of the camp grounds, but about ¾ of a mile from the rifle range itself. The train service is good, although likely to be somewhat congested at times owing to the large number of summer visitors to the popular seaside resorts reached by these lines. The best way to go from New York City is to take the Jersey Central boat from the foot of Rector street, to Atlantic Highlands, and the train the rest of the way. It takes no longer to go by this route, and the journey is far more pleasant.

Arriving at Sea Girt, the visitor can have tent quarters supplied to him free on application to the Post Quartermaster. He can generally be found at the club house of the New Jersey State Rifle Association, which is located close to the 200 yard firing point. Meals are furnished at the mess-hall on the grounds at reasonable rates, and the food while plain is wholesome and well cooked. Putting up in one of the tents, with its wood flooring, comfortable cots, and liberal furnishings supplied by the State, and eating at the mess-hall, is the most satisfactory way of sojourning if one intends to do much shooting. But if he does not enjoy camp life, he can obtain quarters in one of the hotels or boarding houses nearby. The nearest and best equipped hotel is the Beach House, about half a mile to the North of the range, and close to the ocean. There are other hotels further inland, also. Then there are several small houses in Sea Girt, on the opposite side of the railroad, where board at reasonable rates can be secured, but perhaps the most ac-

cessible and convenient private houses where board can be had are those in that part of Manasquan lying just south of the range, across a creek or small inlet. Sea Girt is a place of distances that do not look nearly so long as they are, but one who is used to city life becomes painfully aware that he has walked a long way after a day's tramping about from place to place. The roads are fine, and if one owns a bicycle or automobile it will well repay him to bring it along.

Ammunition of the standard military sizes, of different makes, is on sale during the meeting; but if the rifleman has profited by the foregoing chapters he will have no need of that, but will come provided with ammunition which he knows to be all right. At the range office he can hire a roomy locker during the time he desires to remain, in which can be kept rifle, outfit and ammunition. The locker room is conveniently located close to the firing line, and obviates the necessity of many a long tramp back and forth.

The range itself is regarded as one of the best laid out in the world. The firing points for all ranges up to and including 600 yards are along one line, the 200, 300, 500 and 600 yards butts being disposed at their respective distances. The long ranges are on the extreme left, and the 800 yard firing point is 200 yards back of the continuation of the 600 yard firing line; the 900 and 1000 yard firing points are respectively 100 and 200 yards back of the 800 yard mark.

The range is supplied with the usual flags and clock dials for indicating the strength and direction of the wind, and the young but extremely active Signal Corps of the State maintains a small weather bureau in the telephone house on the firing line, which is equipped with recording type of anemometer, barom-

eter, thermometer, etc., so that after a day's shooting the rifleman who has kept accurate record of his shooting can profit by comparing his records with the records of these instruments for the corresponding time. The butts and the firing line are connected by telephone, and in addition temporary telephone lines are strung by the Signal Corps to various parts of the range, greatly facilitating its operation.

There is some difficulty in obtaining a sufficient number of good and reliable markers and scorers; for although the pay is about the same as the average man's wages in that locality, and surely ought to attract any number of boys, it is near the end of vacation time and the local juvenile population apparently find greater attractions elsewhere. There is some talk, however, of putting the entire operation of the range during the meeting into the hands of the Signal Corps, which would certainly appear to promise great improvement if the work of this corps so far can be taken as any criterion.

The range is run in a semi-military manner, in which that overbearing show of authority so often unfortunately associated with rank is conspicuous by its absence. Officers, men and civilians mingle in one congenial brotherhood. Freedom and cheerful intercourse prevail, many lasting friendships are formed, and a wealth of healthy vigor and pleasant memories stored up by those two weeks' encampment in the bracing salt air of Sea Girt.

APPENDIX.

METHOD OF CLEANING SHELLS.

The classical way of cleaning brass shells is to boil them in a solution of washing soda. This does the work fairly well, but after a time the shells acquire a dirty black color, and there is occasionally trouble with the oxide forming black scales on the inside.

The method I use consists of dipping them in two solutions, which are kept in battery jars and used over and over again until exhausted. No. 1 solution consists of 2 quarts of water, 4 fluid ounces of sulphuric acid, and 4 ounces of potassium bichromate. The solution sold in electrical stores as "red battery fluid" will give practically the same composition as this, if diluted with an equal quantity of water. No. 2 solution consists of ½ pound of potassium cyanide in two quarts of water.

The shells are first rinsed in water, then dipped in No. 1 for not more than 5 seconds, then rinsed thoroughly in water, then in No. 2 for a few seconds, and finally in water again. This process leaves them cleaner even than new shells, and, what is most important, clean *inside* as well as outside.

The washing process is greatly facilitated by the use of a home made wire basket which I use (Fig. 31), with a detachable handle. Arranging the shells in this, with mouths down after they have been decapped, it merely becomes a matter of dipping them first in one solution and then in the other.

Both solutions are poisonous, and if mixed will not only be spoiled but will evolve poisonous fumes. But they certainly clean the shells very thoroughly.

FIG. 31.
WIRE BASKET FOR WASHING SHELLS.

BULLET LUBRICANT.

I spent nearly a year trying lubricating materials of different kinds, but the one finally settled upon as giving the best results is made as follows:

Japan wax, 1 pound; mutton tallow, ½ pound; vaseline, ½ pound.

This mixture can be used either summer or winter with good results. Its hardness can be increased or diminished by varying the proportion of vaseline.

SIGHT BLACK (LIQUID).

Ivory Black, "B," in Japan, (A black paste, obtainable from dealers in painter's supplies in 1 pound cans) 5 ounces.

Gasolene, 76 test, 12 fluid ounces. Add the gasolene little by little to the paste, mixing thoroughly after each addition. If it is found to dry with any gloss whatever, there is too much "binder" in the paste: to correct this, add to the paste a little powdered lamp black and work up thoroughly with the first portion of the gasolene which is added.

Gasolene is used to thin down the paste with because of its quick drying properties. This mixture will dry on the sights in a few seconds.

ANTI-RUST GREASE.

Where rifles are to be put away for some time, or exposed to salt air, a heavier grease is generally preferable. Cosmoline, gas engine cylinder oil, and mercurial ointment are all excellent preservatives, but should be removed from the barrel perfectly before beginning to shoot. Gas engine cylinder oil, in particular, has seemed to me to affect the shooting badly in the case of lead bullet rifles if the least trace of it is left in the barrel.

A mixture that is very popular among the members of the Manhattan Rifle and Revolver Association, New York, is made by melting 1 ounce of beeswax, and adding 2 ounces each of hot astral oil and sperm oil. It has about the consistency of butter.

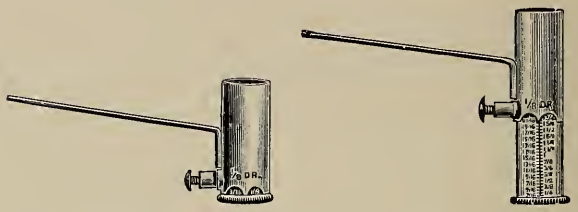
NITRO-CLEANER, FOR CLEANING OUT THE RIFLE AFTER FIRING SMOKELESS POWDER.

Astral oil, (tested and found free from acid) 2 fluid oz. Sperm oil, 1 fluid oz. Turpentine, 1 fluid oz. Acetone, 1 fluid oz. Mix.

This formula was originally worked up especially for "W. A." powder, but unexpectedly has also turned out to be a good rust preventive as well. The best way to use it, which should be done immediately after shooting, is to dip the brass cleaning brush in the solution and scrub it back and forth in the gun a few times; always cleaning from the breech if possible, and allowing the brush to turn and follow the rifling —not pushing it straight through, as I have seen some men do. The gun can then be allowed to stand for a time, when a dry rag should be used on the knob end of the cleaning rod. It is surprising how much black dirt will come out on the rag when the gun appeared to be almost clean. The dry rag should be followed with a second one wet in the solution. It is best to repeat the process next day, for the gases seem to be driven into the pores of the metal and to sweat out during the 24 hours following the firing; hence the necessity of the second cleaning.

The "W. A." powder residue itself would probably never have to be cleaned out from the gun were it not for the material used in the primer. "W. A." residue is practically harmless, but the products of the primer mixture are extremely corrosive, especially on certain kinds of steel. Therefore, if you want your barrel to last even through one season you must take care of it.

POWDER MEASURE.



In the chapter on ammunition I stated that when using smokeless powder for long range shooting the charges should be weighed. But as this operation takes considerable time, many riflemen when loading for short and mid-range work may prefer to dispense with the weighing operation, and measure the charges.

The "W. A. 30 calibre" smokeless does not feed well through the majority of hand loading machines, and charges of this powder can be dipped by means of a scoop more accurately than they can be thrown by means of a machine, unless the latter is especially constructed for "W. A." powder. A very neat and effective little powder scoop has been designed by Mr. Ed. Taylor, of the Laflin & Rand Powder Co., for measuring "W. A." and other powders made by that concern. As smokeless powders differ greatly in their volumetric density, and as it is the weight and not the bulk that determines the force of a given charge of powder, no attempt was made to graduate this measure in grains; instead, it has been graduated in sixteenths of a dram. A table is furnished with each measure, showing what amount of each kind of powder should be used to give the standard velocity; this amount being expressed both in grains (weight)

and in volume (drams). For instance, the standard load of the 30 cal. U. S. Government cartridge is given at 34 grains, or 1½ drams volume.

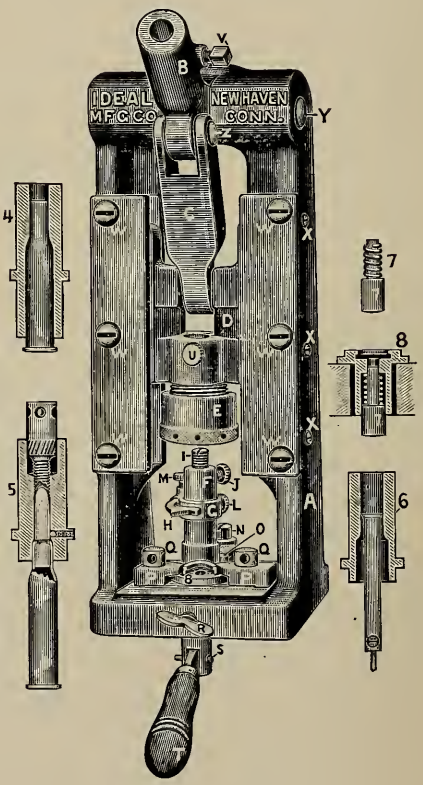
I have seen Mr. Taylor dip a long series of charges with this measure upon the pan of a fine balance, with a variation of less than half a grain. One can become expert at dipping powder, the same as in other things, after sufficient practice. If one-half grain was the limit of variation for all of us in dipping powder charges, few would weigh their charges even for long range shooting. The difficulty is that, when everything appears to be working smoothly, there will be one charge dipped apparently just the same as many previous ones and yet it will weigh perhaps 2 or 3 grains less than the regular load. It is for this reason that I have advocated the use of the scales. You need not balance each charge to any exceptionally fine point if you don't want to use the ammunition at long range; for a variation of ½ grain will cause little trouble up to 800 yards, and even beyond. But if you dip onto the scale pan instead of directly into the cartridge shell, the balance will immediately reveal any charge with an excessive variation—and it is much pleasanter to make this discovery at home than to get the unexpected low shot or miss when at the range.

But even when the charges are weighed, it is a great convenience to have a good scoop like this one, that can be set so as to deliver very nearly the correct amount of powder on the scale pan. And as the little measure is quite inexpensive, I would recommend the shooter to buy one from the Laflin & Rand Powder Co., for it is sure to come in handy at some time.

THE IDEAL LOADING PRESS.

For the convenience of riflemen who wish to do their own loading and re-loading I herewith insert cut of a new loading press just perfected by the Ideal Mfg. Co., of New Haven, Conn.

I have not tried this press personally, but from the description I judge it will be found of great value.



THE IDEAL LOADING PRESS.

The Ideal Loading Press is about eleven inches in height; when packed in case ready for shipment with a full set of tools, will weigh between twenty and twenty-five pounds. It is not necessary to describe it, as the illustration shows it to be a perfect little giant, of the well known lever link and sliding gate construction, giving ample straight line up and down movements of sufficient capacity for all requirements. A rod twelve inches in length fits into the hole shown in top lever near letter "B." The various tools are shown in sections along the sides of the press and designated by numbers.

No. 4.—SHELL RESIZER for reforming the expanded shell back to its original shape and size.

No. 5.—DOUBLE ADJUSTABLE CHAMBER which will enable the user to seat the bullets correctly and crimp or not crimp the shells as desired. This in connection with the back stop can be adjusted to overcome all the varying lengths of the shells, and the varying locations of the crimping grooves on the metal covered bullets.

No. 6.—DE-CAPPER AND MOUTH OPENER for expelling the old primer, straightening out the old crimp at the mouth of the shell, leaving the muzzle in correct shape to receive the new bullets.

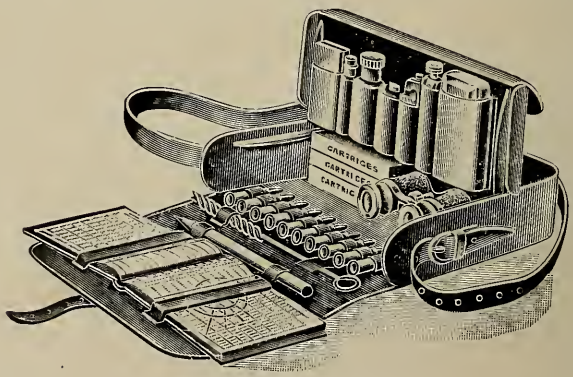
No. 7.—RE-CAPPER PUNCH AND SPRING is inserted in shell holder No. 8, by entering it underneath the bottom of press, when placed in No. 8 swing the lever "T" into place and fasten with thumb screw "R." This will be found a very efficient straight line re-capper.

No. 8.—SHELL HOLDER, which is located on the bed, centrally under the sliding gate and fastened by the clamps "P.P" and screws "QQ." Into this all shells are inserted for all operations and when once set and the various stops adjusted according to in-

structions which accompany each press, no re-arranging will be required to perform the various operations.

Each operation has its own set of stops, which do not conflict or interfere with those belonging to another operation, and which may be swung out of the way and they will always be found ready set for use when called into action. The value of this can only be appreciated by those who actually use the press. Those who desire to reload shells in quantities will make no mistake in looking well into the merits of the Ideal Loading Press.

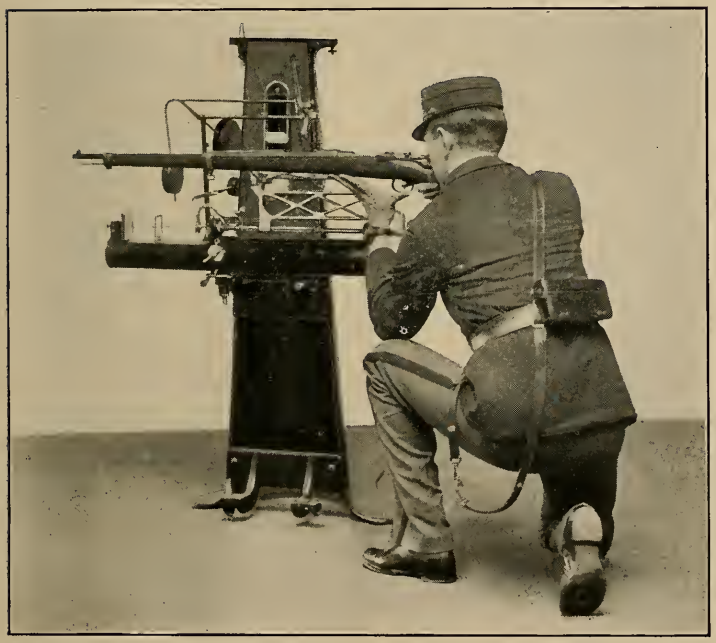
Since writing the main portion of this work I find that Thos. J. Conroy, of 28 John Street, New York City, is now handling a regulation British Shooting Bag. The accompanying cut rather fully describes it.



BRITISH SHOOTING BAG.

SUB-TARGET GUN MACHINE.

A very ingenious device for aiming practice which has recently been brought out is called the "Sub-Target Gun Machine," and is made by the Sub-Target Gun Co., 11 High street, Boston, Mass. It consists of a system of levers and parallel rods, connected with any kind of a gun, the gun being freely movable in all directions. Aim is taken at a target placed 25 or 30 feet away, and reduced to the size that would be proportionate for that distance.



SUB-TARGET GUN.

During the aiming, a pointer on the machine is seen to make movements (highly magnified) corresponding with the efforts of the marksman in directing the rifle, and when the trigger is pulled, a needle in the end of this pointer punctures a replaceable miniature cardboard target, which is carried in a receptacle on the machine, showing just where the gun was aiming at the instant of pressing the trigger.

The apparatus operates on definite mathematical principles, and the little cardboard target, when removed after a string of five or ten shots, gives a very close record of what the shooting would have been.

This machine should greatly facilitate instructors in "teaching the young idea how to shoot." The only drawback is the price—$250.00. It is quite evident, however, that a machine of this kind must require extreme care in its manufacture, though perhaps when it is turned out in larger quantities its makers may be able to supply it at a lower figure.

APPLIANCES, TOOLS, ETC., THAT EVERY RIFLE RANGE SHOULD HAVE.

A system of electric communication between the targets and the firing point is almost a necessity on a well-equipped range. The telephone affords the most perfect communication of all, but by arranging a judicious code of signals even a set of ordinary call bells can be made to answer, and of course will be cheaper. The magneto call bell is the most reliable, operating as it does without battery—its electricity being generated by mechanical means. But it is not so easy to transmit short and distinct signals when a crank has to be turned, and if the ordinary electric bell be taken apart and its magnets re-wound with fine wire (No. 30, 31, or 32) it will generally prove even more satisfactory. Such a bell, together with a double circuit push key and 6 cells of the small dry battery used for operating miniature lamps, all properly connected, can be mounted in a small wooden box, provided with a handle for ease in carrying; making a very convenient and portable bell set, with which signals in either direction can be transmitted with rapidity and precision up to 1000 yards.

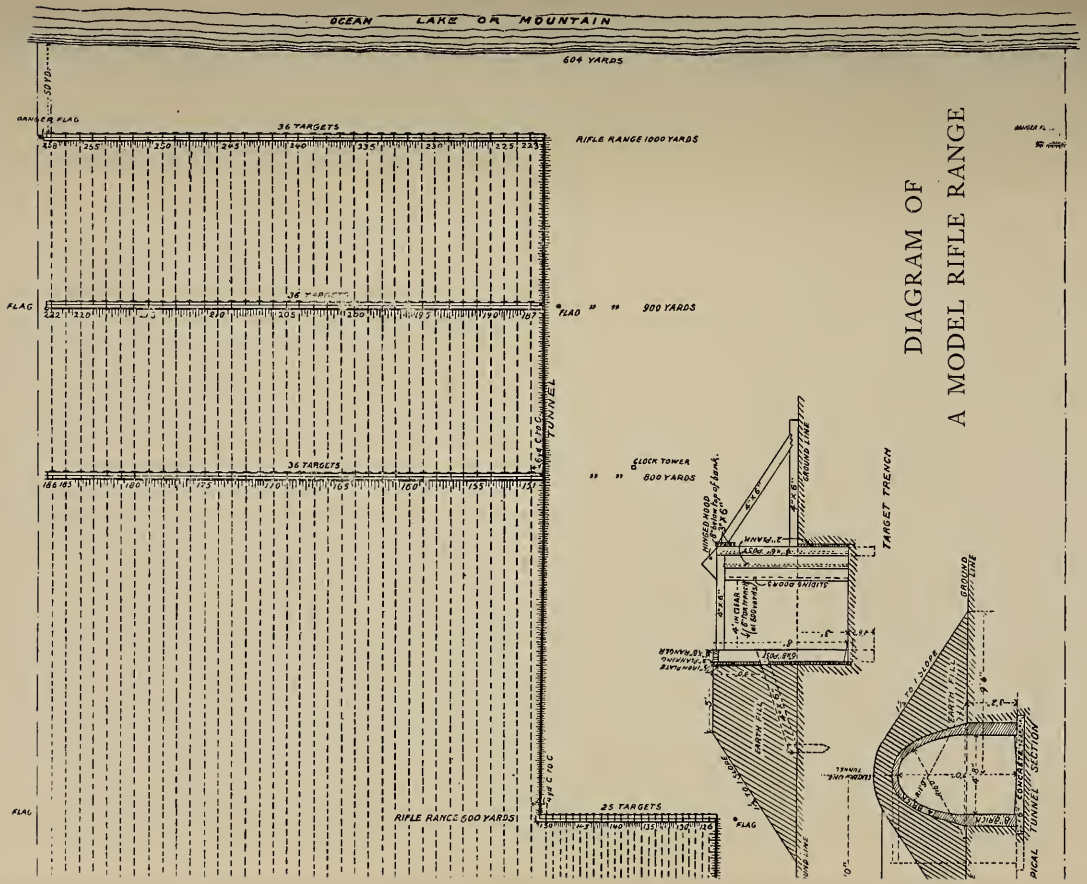
Wires for rifle ranges should, when possible, be placed under ground. This is expensive, owing to the high grade of insulated and protected wire it is necessary to use for underground work. But it is astonishing how easily and frequently overhead wires are hit by rifle bullets when they are not being aimed at. The failure of accustomed electric communication during a shoot is always annoying and may even become dangerous, therefore precautions are well taken.

One wire for each set of bells or telephones is sufficient if a lead covered cable is used, or if a good "ground connection" can be made. Otherwise it is better to use a metallic circuit or separate return wire.

I am aware that one will have to understand something of electricity and its practical application to profit by the above, but nearly always such a one will be found in a group of riflemen, and I therefore offer these observations without misgivings. I have fitted up several systems as described, and must say that for quick and convenient work the battery bell system, with a judiciously arranged code of signals and a telephone set to be switched in occasionally if found necessary, affords the greatest satisfaction.

For accurate observations in long range shooting the range should be provided not only with flags and wind clocks, but with an anemometer, barometer, thermometer and hygrometer—preferably recording instruments, so that their readings during any time of the day can be compared with the shooting for the corresponding time. It is only by these means that satisfactory study of the problems arising in long range shooting can be carried on.

Every rifle range should be provided with a fairly well equipped shop. The larger the assortment of tools the better, but there should be at least a good vise, with leather jaws, files, hack saw, drills and drill stock, screw drivers of various sizes, pliers, wrenches, etc. During an important meeting the tool room should be in charge of a man responsible for them, and who knows how to use them.


OCEAN LAKE OR MOUNTAIN
604 YARDS
DANGER FLAG
36 TARGETS
RIFLE RANGE 1000 YARDS
FLAG
900 YARDS
TUNNEL
CLOCK TOWER
600 YARDS
TARGET TRENCH
DIAGRAM OF
A MODEL RIFLE RANGE
25 TARGETS
RIFLE RANGE 500 YARDS
GROUND LINE
SECTION

A MILITARY RIFLE RANGE.

Reprinted through the courtesy of the U. S. Cartridge Co., Lowell, Mass., from their work "Military Rifle Shooting."

A perfect military rifle range is difficult to obtain. This was not an easy task when the U. S. Springfield rifle was the arm used by the regular troops and volunteers, but now that the U. S. Magazine rifle has superseded the former in the regular army and is being adopted by the volunteer militia the difficulty is enhanced, on account of the high power of the latter, its range and penetration being much greater than the U. S. Springfield rifle.

Military rifle ranges, especially those for volunteers, are generally adjacent to some city or town. They are sometimes regarded as unsafe, this fear often being well founded. Range practice with military rifles will be increased in this country from now on; modern rifles and ammunition require increased safeguards, consequently the question of providing a properly equipped military rifle range is each year becoming more important.

In the opinion of most rifle experts a perfect military rifle range would consist of a level plot of land 1200 yards long by 600 yards wide, with high wooded hills on three sides and the ocean behind the fourth side, the latter side being at the north, the firing points for rifle and revolver all being on one line across the range. This is a very important point, which has generally been disregarded in the past but should be borne in mind when laying out the range. No rifle range is safe with one firing point behind another.

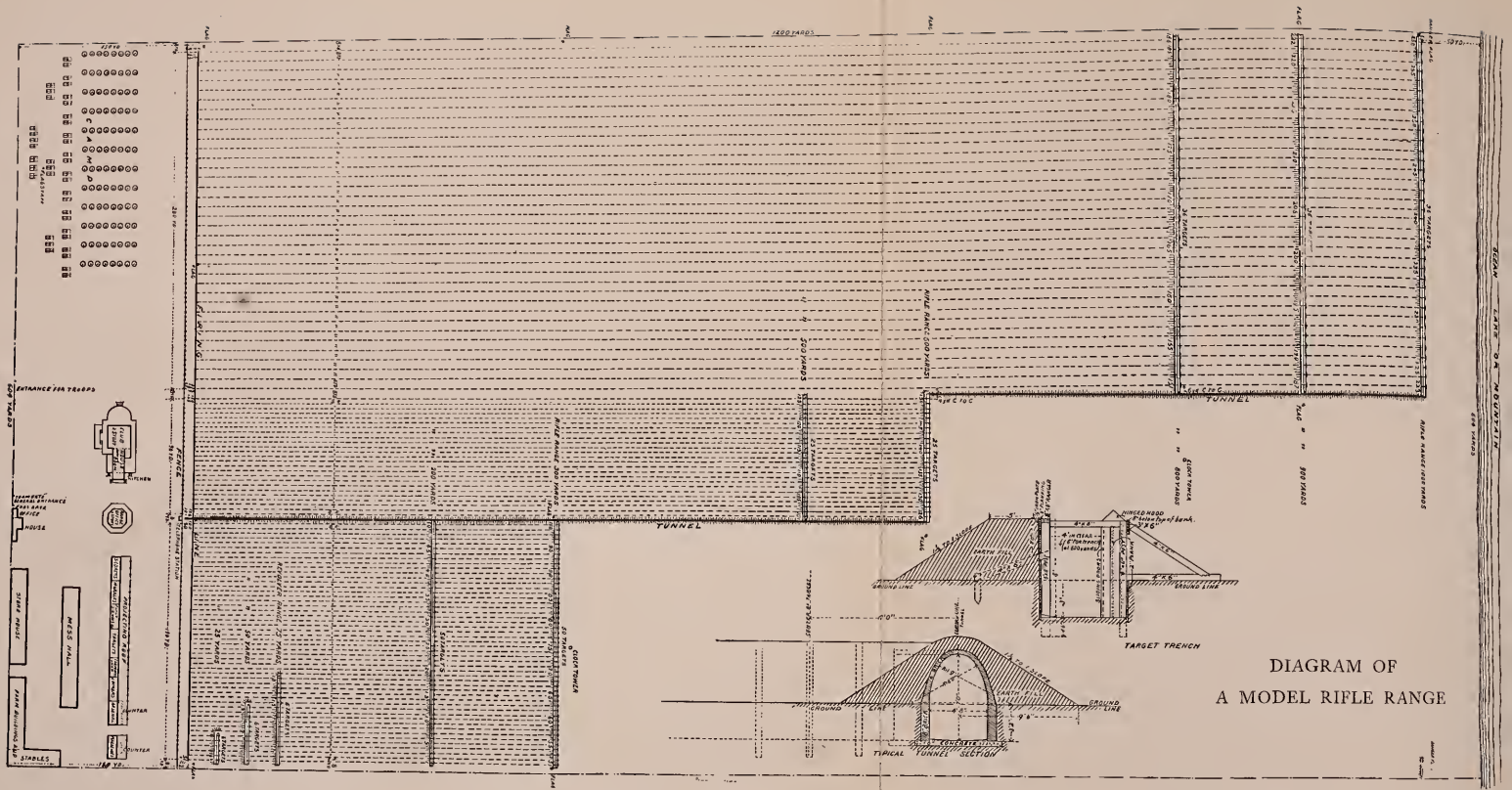


DIAGRAM OF
A MODEL RIFLE RANGE

An illustration of a perfect military rifle range is herewith presented, prepared by the acknowledged expert engineer and rifleman, Captain W. F. Whittemore, of the New Jersey National Guard.

It would be quite difficult to find a tract of land as described situated at an accessible point, therefore some of the advantages must necessarily be dispensed with, but still an excellent rifle range may be secured. The tract of land 1200 by 600 yards might be changed to 1200 yards long from east to west by 600 yards at the firing point north to south and 50 yards north, making a plot of land nearly a right angled triangle in shape. The surrounding hills and woods should be secured if possible as they would serve as breaks for winds from the different directions; they would also prove something of an aid in stopping shots accidentally fired; but the hills and woods could be dispensed with and still an excellent range secured. The range might not be perfectly level, but it would certainly be a decided advantage to have it so. A tract of land containing gullies is very objectionable as with such conditions currents of air more readily form which have a great effect on the bullet's flight; when the land is level there is less trouble from unnoticed currents of air.

The ocean for a backing for a rifle range is admitted by experts to be unexcelled and the greatest safeguard. A mountain or high hill for a background is good, but the ocean is better. A hill or mountain is likely to be visited by some unsuspicious person while rifle practice is in progress, who will be accidentally shot; bullets, too, with such background are likely at any time to strike rocks in the earth and ricochet wildly. With the ocean for a background a lookout can readily detect any approach to the danger line and signal a warning to cease firing. Shots striking the water are not likely to do any injury.

The advantage of having but one firing line is probably apparent to experienced riflemen. Most rifle ranges are laid out the reverse of what they should be. Usually there is a long line of 200 yard firing points, in the rear of which come the 300 yard firing points, behind those the 500, the 600, 800, 900 and 1,000 yard firing points. By such an arrangement the marksmen at 200 yards are in danger from all wild shots or accidental discharges from all the firing points back of them and so the danger continues to each squad that have men behind them shooting at longer ranges. This danger is now generally recognized, and if a range is laid out with one firing point behind another, barriers, or safeguards, consisting of two sets of boards some 20 inches or more apart, are erected and the interstices filled with rocks. These safeguards are usually erected about 20 feet from the firing point, the shot being fired through a port hole. By this arrangement a wild shot that would not hit the target is caught in the safeguard. These barriers, however, do not entirely insure safety from accidental shots.

The range of the New Jersey State Rifle Association, at Sea Girt, N. J., probably is the nearest perfect military rifle range in the United States. It has the firing points of revolver ranges, 200, 300, 500 and 600 yard rifle ranges all on one line; if it had 800, 900 and 1,000 yard firing points on this one line it would be as near perfection as one is likely to find, as the range is level, free from rocks, and has the ocean for a backing to the targets.

The range of the Massachusetts Rifle Association, at Walnut Hill, Woburn, Mass., is an excellent example of a safe inland rifle range. This range when first built was necessarily laid out with one firing point behind another, but every known precaution of utility has been employed to make the range safe.

Great care should be exercised in measuring the different distances over which shooting is done. It is astonishing how many rifle ranges of the past have been found incorrectly measured. A point of vantage for a firing point, or advantageous place to plant the target has influenced many riflemen to disregard exactness in the distance fixed to shoot over. Every first class military range should be laid out by a competent engineer.

A modern rifle range should be built so as to expeditiously accommodate, as far as possible, those who wish to shoot, and at the ranges they wish to shoot. It should be so arranged that many third class targets (for 200 yard shooting) could quickly be made ready for use; or if many second class targets were desired for 500 and 600 yard shooting, the third class targets could be lowered out of sight and shot over to the second class targets. Again, if a number of first class targets were wanted, the targets in front of them could be lowered and shot over to the first class targets. Such an arrangement of targets could be secured by building the longer range butts higher than those of the short range. A sheltered subway running from the firing points to the different pits would prove very convenient and be an additional safeguard. By such an arrangement a range hand could quickly reach the pits or return therefrom, without the firing ceasing and without exposing himself to danger.

Reference has been made to placing the targets to the north; this is to avoid as much as possible the sun shining in the shooter's face, which is more likely to occur when the targets are placed to the east or west. With two persons shooting at a target, one in the morning with the sun behind him, the other in the afternoon with the sun in his face, the former would have a decided advantage.

A rifle pit may be defined as a trench for protecting a marker.

A butt is a raised mound in front of targets, a safeguard for the marker in the pit.

The rifle pit and butt are so closely connected they are treated together. In building a target pit it is usual to excavate earth to the depth of a few feet, utilizing the earth for the formation of the butt. Sometimes the natural lay of the land is a great aid in accomplishing this object, but usually, especially if the range is level, the excavation is necessary and the butt is constructed from the earth excavated, and often added to by additional earth. First, absolute certainty of complete protection against bullets reaching the marker must be secured. This means a butt of not less than 12 feet thick.

There are various ways of constructing butts. The easiest way is simply piling up earth, which naturally would take a sloping shape of about 35 degrees. This shape is not objectionable on the side facing the shooter, but is not desirable on the side nearest the marker, for the necessary width of the base of such a constructed butt places the pit too far back of the butt. The writer is an advocate of a deep pit and no higher butt than is necessary for safety. Assuming that the land selected for a range is level or nearly so, thick posts should be driven in front of the proposed pit. An excavation at least 6 feet deep would then be made and the earth piled in front of the rear posts. The butt, or mound, should be not less than 12 feet thick at the base and 9 feet thick at the top. This butt should be of solid earth and packed very solid.

The bottom of the pit should be so arranged that drainage can be secured. To accomplish this lay at the bottom of the pit small stones, over which place logs

and over those planks. It is usually desirable to place the row of posts and boards at the back of the pits, to keep the earth from falling into the pit. The pits are generally so arranged that they may be covered at the top when not in use and the ends are closed by doors. The pits should be safe, clean and dry. This can be secured by following the foregoing directions, but if means permit, in place of the posts and boards masonry could be substituted, and the bottom of the pits bricked or asphalted, and gutters provided for drainage. This latter arrangement, however, would be much more expensive.

SCALES illustrated on page 113 can be procured from the
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